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The Chemical Age

A Weekly Journal Devoted to Industrial & Engineering Chemistry

VOL. II. MAY 22, 1920 No. 49

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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Other communications relating to advertisements or general matters should be addressed to the Manager.

The prepaid subscription to "The Chemical Age" is 21/- per annum for the United Kingdom, and 26/- Abroad. Cheques, P.O.O.'s, and Postal Orders should be payable to Benn Brothers, Ltd.

Editorial & General Offices—8, Bouverie Street, London, E.C.4. Telegrams: "Allangas, Fleet, London." Telephone: City 9852 (4 lines).

The Annual Meeting

THE programme provisionally arranged for the Annual Meeting of the Society of Chemical Industry, to be held at Newcastle July 13 to July 16, is one of at least quite average interest. The meetings will be held in the Armstrong College, and outside the sittings there will be opportunities for social gatherings and for visits to a number of works. At the annual general meeting the conference will be formally welcomed by the Lord Mayor (Mr. Walter Lee) and the Principal of the College (Sir Theodore Morison). The President (Mr. John Gray) should find abundant matter for his address from the chair in the various developments during his year of office, and in the problems with which the Society is now faced.

After luncheon in the King's Hall, Armstrong College, by invitation of the Newcastle Section, the afternoon of the first day, Tuesday, July 13, will be occupied by a sitting of the conference for the discussion of the question of by-product coking and by a conference of the Chemical Engineering Group. At the former papers will be submitted on "The Coke Oven" (W. A. Ward), "Corrosion of Coke Oven Walls" (W. J. Rees), "The Recovery of By-Products" (E. W. Smith), "The More Economical Utilisation of Coke Oven and Blast Furnace Gases for Heating and Power" (G. W. Hewson and S. H. Fowles), and "Coke Oven Gas for Towns' Supply" (H. E. Wright).

The subject for discussion at the Chemical Engineering Group's fourth conference is "Filtration," and the following papers will be submitted: "The 'Sturgeon' Automatic Self-discharging Centrifuge" (R. A. Sturgeon, A.M.Inst.C.E., of the Sturgeon Centrifuge Co., Ltd.); "The Principles of Technical Filtration" (E. Hatschek, A.M.I.M.E.); "Recessed and Plate and Frame Types of Filterpress: Their Construction and Use" (E. A. Alliott, B.Sc.(Eng.), A.M.I.M.E., of Manlove Alliott & Co., Ltd., Nottingham); "A New Process for Centrifugal Filtration" (W. J. Gee, director of Centrifugal Separators, Ltd.); "The Filtration of Colloids" (W. R. Ormandy, D.Sc.); "The Sharples Super-centrifuge" (S. H. Menzies, managing director of United Water Softeners, Ltd.).

In connection with Mr. Sturgeon's paper, it is hoped to be able to show a machine of the type to be described in work. Mr. Alliott's paper is expected to give all possible information other than that found in catalogues regarding the construction, selection, use and working of the types of filter press considered, and to include a comprehensive exhibition of constructional materials and filtering media. The only Vickers-built machine to be described in Mr. Gee's paper is at work in a factory near Newcastle-on-Tyne, and permission has been granted to inspect the machine under ordinary working conditions. In connection with Dr. Ormandy's paper, a new filter press, based on the phenomenon of electric endosmose, for separating colloidal from liquid matter will be described, and a press of this type shown at work. It may be explained that the Sharples super-centrifuge to be described by Mr. Menzies, is a centrifugal with imperforate basket, rotating at about 20,000 revs. per min., and used mainly for the clarification of liquids, *e.g.*, varnishes. A machine will be shown at work. The first day's proceedings will close with a civic reception by the Lord Mayor.

Wednesday morning will be occupied by sittings of the Society and of the Chemical Engineering Group. At the former papers will be submitted on "Some Properties of 60-40 Brass" (C. H. Desch, D.Sc.),

"Catalytic Chemical Reactions and the Law of Mass Action" (E. F. Armstrong, D.Sc.), "Recent Developments of the Electric Furnace in Great Britain" (D. F. Campbell), and "Chemical Sheet Lead" (D. W. Jones). The afternoon will be spent in visits to works, and the annual dinner will take place in the evening.

Thursday will be occupied with visits to works, and the Newcastle Section have arranged a conversazione for the evening. Friday will be given up to a whole-day motor excursion. During the conference week and until July 24 an exhibition of chemical products, &c., of the district will be held in the Armstrong College buildings. The following members of Council retire this year: Mr. John Gray, president; Dr. C. C. Carpenter, Professor A. R. Ling, Professor R. F. Ruttan, and Mr. J. T. Wood, vice-presidents; Messrs. A. G. Bloxam, W. J. Rees, E. Thompson, and Professor J. Walker, ordinary members. Mr. Gray has been nominated Vice-President, and Mr. D. Lloyd Howard, Dr. S. Miall, and Mr. E. Thompson Vice-Presidents. Owing to an unexpected delay, for which the Society is not responsible, it is not yet possible to announce the nomination of the new President, and the name of the President-elect will be published later.

Machinery v. Labour

THE recent meeting of the Chemical Engineering Group at Birmingham should have assisted many of those who contemplate the substitution of machinery for manual labour to come to a definite conclusion as to the relative merits of the alternative systems. The problem has assumed very much greater importance during the past few years, and, in many cases, the attitude of labour is now such that many of the objections raised against machinery in the past no longer hold good. For instance, one of the main arguments against the employment of mechanical apparatus was that the unimpeded carrying-on of any particular operation depended largely on the factor of breakdown. Manual labour, it was pointed out, was undoubtedly certain in practice, and the extra cost incurred in ensuring this certainty was in all probability well expended. Labour to-day, however, is a fickle item, and is gradually establishing for itself a reputation of general unreliability. It is not surprising, therefore, that the majority of the larger concerns are taking steps to eliminate it as far as possible, and the chief question at the moment is as to what capital outlay on machinery is permissible in order to save the wages of a single man. For instance, the ordinary labourer to-day demands 1s. 6½d. per hour, he works 47 hours a week, and (in order to include all extras, such as insurance, holiday pay, &c.), the customary method is to assume a year to contain 54 working weeks. The outgoings on one man amount, therefore, to very nearly £200 per annum. On the other hand, the charges on capital have been shown to be adequately met in cases of mechanical handling by setting down 5 per cent. for interest, 5 per cent. for wear and tear, and 7½ per cent. for depreciation, making a total of 17½ per cent. Each year, however, the sum on which interest has to be paid is written off by 7½ per cent.; thus, during the 14 years in which it takes to pay the capital back, the *average* rate of interest is only 2½ per cent., making the total average charges on capital 14½ per cent. Accordingly, the capital expenditure permissible in order to eliminate one man is £1,400, the charges on this sum at 14½ per cent. amounting to approximately £200 per annum, or the equivalent of a labourer's wage. This figure is certainly striking, and it will be realised that comparatively large schemes can be profitably undertaken when a saving of 10 or more men can be shown. It must, of course, be borne in mind that the cost of plant to-day is exceptionally heavy, comparatively small schemes running into large sums; moreover it is rather discouraging to find that time for erection and delivery of mechanical plant is an item upon which no definite guarantee can be obtained.

A Colloid Symposium

AT the annual meeting of the American Chemical Society, held in St. Louis last month, the several applications of colloids were comprehensively covered by Mr. Jerome Alexander. The subject is one which we have always followed up energetically, for it is evident that the near future is destined to see many revolutionary changes as the use of colloidal principles in industry are gradually turned to account. Speaking of the preparation of colloidal fuel, Mr. Alexander remarked that the coal or other combustible solid employed is prepared for dispersion by being pulverised so that 95 per cent. passes through a 100 mesh, and 85 per cent. through a 200 mesh screen. It has been found that a fluid fuel may be made containing as much as 40 per cent. by weight of powdered coal, and mobile pastes containing up to about 75 per cent.

The exact nature of the fixateur is withheld pending the issue of extensive patents; but it is stated that ordinarily between 0·5 and 1·5 per cent. of the essential component of the fixateur is used, whereas about 0·1 per cent. exercises a noticeable influence. The amount is determined by the nature of the mixture, the component and the degree of permanence desired. The bulk of the particles does not begin to settle until the period of "life" has passed, the colloidal fuel having a limited "life" which may be regulated to meet requirements—days for power plants, weeks and months for ocean-going vessels and central storage stations. Heat and agitation revivify the liquid fuel, and the paste form may be kept for years.

Being heavier than oil or even water, colloidal fuel compresses in a unit volume the maximum thermal value, thus economising storage space; and it may be stored under and extinguished by water, thus avoiding evaporation, deterioration and fire risk. Its operative efficiency is high, for when sprayed into the hot fire box the oil-permeated particles of carbonaceous matter are still further atomised by the sudden gasification of their absorbed oil. Although, perhaps, it is in the direction of fuel that colloids are attracting chief attention at the moment, it must not be forgotten that developments are quickly taking place in other directions. For instance, the world demand for oil has resulted in an enormous increase in the cost of lubricants; but we are now told that we may with confidence look to colloidal chemistry to supply the lubricants of the future.

British Dyestuffs

THE report of the directors of British Dyestuffs Corporation, Ltd., presented at the first ordinary general meeting of the company yesterday (Friday) discloses a satisfactory position. The amount available for distribution is £172,504, and after the payment of 7 per cent. on the preference shares and of 8 per cent. on the preferred ordinary shares, the company will be able to carry forward £58,826. The trading results, though substantial, give no ground for the view that the concern is making abnormal profits out of the industry; the company receives but a modest return on the capital and enterprise they have freely expended on establishing this key industry on stable foundations. The business of the associated companies has been adversely affected, as might be expected, by the transition from war to peace conditions, but the difficulties are being rapidly overcome and important extensions and developments are contemplated which will substantially increase the volume and range of dyestuffs in the future. In spite of the delivery in obtaining new plant and equipment continuous and substantial progress is reported to have been made. By August 31, 1919, for example, the volume of output was approximately two-thirds of the total weight of dyestuffs consumed in the United Kingdom during 1913. This fact alone indicates the rate of progress towards making this country self-dependent. The report states that the recent general expansion of trade has led to an unprecedented demand on this country for dyestuffs, both in quantity and in variety, and that this must be met by correspondingly increased efforts in the direction of production and research. The directors have recognised the paramount importance of having a department where research work can be carried out along the most modern and scientific lines.

Progress in Electrical Osmosis

THE various aspects of colloidal chemistry and the properties of clay considered as a colloid have been discussed from time to time in these columns, and the lecture delivered on Wednesday at the Royal Society of Arts again brings this important subject into prominence. Under the title of the "Commercial Application of Electrical Osmosis," Mr. J. S. Highfield, Dr. W. R. Ormandy and Mr. D. Northall-Laurie report progress in the application of this branch of science to industry, and although the fundamental theoretical work on the colloidal state originated in this country, it was in Germany that its first real application was deeply studied. The Schwerin patents alone constitute a text book on the subject, but it has taken a world war to induce in this country a semi-appreciation of the part which science must inevitably play in industry. Yet in colloid chemistry, which is of fundamental importance in so many industries, of which clay, tanning and dyeing may be instanced at random, has as yet no Chair in a British university. Manchester is making an effort to remedy this defect, but is hampered by lack of funds; while, on the other hand, the British Cotton Industry Research Association has recently invited applications for the position of head of the Colloid Chemistry and Physics Department.

The application of modern theories to the purification and drying of clays was first made widely public by Count Schwerin in a paper before the International Science Congress, held in Berlin about six years before the war. Our knowledge of the subject in this country is largely due to Dr. Ormandy, who, realising the possibilities inherent in the processes, went to Frankfurt to study them under Count Schwerin, and then read a series of papers before the English Ceramic Society. It was only to find that the time was not propitious—neither the clay producer nor the clay user realised or could be made to realise that there was a market for a high-grade refractory product.

The lecture referred to above—a simple, popularly-worded précis of the subject matter of the earlier lectures—has come at a time when the commercial world is more receptive, and when new industries are calling for better products than pre-war methods could supply. Mr. Highfield also deserves credit for his work in utilising osmosed clays in furnaces, &c., for the manufacture of optical and other glass required during the war, and for the admirable way in which the lecture was delivered. The wonderful exhibits and micro-photographs—some in natural colours and under polarised light—which were shown, and the experiments and demonstrations of the working of the process on a large laboratory scale, were of absorbing interest, and set a standard not often reached even at the Royal Society of Arts. The discussion brought out many interesting points, and lends colour to the hope that in the near future, and under new and better conditions, Dr. Ormandy's foresight and patience will be justified, and that not only in regard to refractories, but also in the development of the peat industry and the recovery of waste products, progress here will not continue to lag behind that made on the Continent.

The Calendar

May 21	Royal College of Science Union: "Activated Charcoal," by A. J. Somer.	Chemical Society, Royal College of Science, South Kensington, London.
25	London University: "The Biochemistry of Sterols," by J. A. Gardner. 5 p.m.	Physical Laboratory, South Kensington, London.
27	Society of Chemical Industry (Liverpool Section): "Photographic Images, Visible and Invisible," by F. F. Renwick.	Liverpool.
28	Society of Chemical Industry (Liverpool Section): "Modern Developments of Hurter and Driffield's Photographic Researches," by F. F. Renwick.	Liverpool.
28	Royal Society of Arts: "Lignite," by Professor W. A. Bone. 4.30 p.m.	John Street, Adelphi, London.
28	Royal Institution of Great Britain: "Crystal Structure," by Professor W. L. Bragg.	21, Albemarle Street, Piccadilly, London.
29	Royal Institution of Great Britain: "Recent Revolutions in Physical Science—(1) The Theory of Relativity."	Albemarle Street, Piccadilly, London.
June 1-2-3	The Institution of Gas Engineers: Annual General Meeting.	Institution of Mechanical Engineers, Storey's Gate, London.
2-5	South-Eastern Union of Scientific Societies: 25th Annual Congress.	Eastbourne.

Industrial Applications of Liquid Air and Oxygen—I

By "Ergo"

The writer of the following article, which is the first of a short series on the subject, was associated for some time with the technical application of liquid air to purposes connected with the war. He proposes to deal with the subject on more or less popular lines, and discusses below the difficulties connected with the storage of liquid air.

When the properties of liquid air were first demonstrated in this country at meetings of scientific societies, many people foretold a great future for it for commercial purposes; but, so far, it has not reached expectations in this direction. Although the commercial development has been small the amount of scientific progress made has been very extensive, and there now appears to be every likelihood of considerable application in industry.

Before going further into the subject, it should be pointed out that liquid air and liquid oxygen are practically the same, the former being an impure or diluted form of the latter. According to the process by which it is produced, liquid air usually contains from 40 per cent. upwards of oxygen. As the liquid stands, the nitrogen boils off first, so that the air gradually contains more and more oxygen as it boils away. It seems strange at first to speak of boiling of an intensely cold substance at −180°C.; but it will be realised that the liquid is always boiling and that the vessels in which it is contained must be so constructed as to allow the boiling to take place. Otherwise, such a tremendous pressure would be generated that the vessel would burst.

In the present articles it is proposed to consider the subject from the standpoint of storage and transport, special applications and manufacture.

Storage and Transport

This branch of the subject is really the most important. As will be seen later, liquid oxygen can be used for medical purposes, for welding or for any of the other purposes for which compressed gaseous oxygen is being used at the present time; it also has considerable possibilities as an explosive in mining work and was used successfully in one at least of the Alpine tunnels.

Further, the commercial process now most largely employed in the manufacture of compressed oxygen consists first in making pure liquid oxygen by liquefaction of air and then allowing it to boil off. The gas is then compressed into cylinders, the standard pressure in this country being 120 atmospheres. The equivalent initial cost of liquid oxygen should, therefore, be at least as low as that of gaseous oxygen.

Comparative Weights for Transport

For purposes of approximate calculation we may assume that a given volume of liquid oxygen produces about 750 volumes of gas at ordinary temperature and pressure, and that a storage container of the type which we will describe later weighs about 30 lb. Such a container holds about 5 gallons of liquid, which corresponds to $\frac{5\times750}{6\cdot25}=600$ cubic feet of free gas.

The standard storage cylinder for compressed oxygen holds 100 cubic feet of free gas and weighs about 110 lb.; it will thus be seen that the dead weight to be transported for the same effective volume of gas is 22 times as great with compressed gas as with the liquid. Even assuming, as appears probable, that improved methods of steel manufacture will enable the weight of storage cylinders to be reduced to 80 lb., the dead weight for compressed gas would still be 16 that for liquid. On the other hand, it must be remembered that the liquid containers are at present more expensive in initial outlay and depreciation, and that in liquid containers the gas is always boiling away. It is proposed to deal later in detail with the question of liquid containers, but we may take it at the moment that in first-grade containers of the capacity above referred to the liquid will all boil away in 14 days. The use of liquid oxygen is, therefore, practically restricted to those localities in which supplies can be delivered within two days of production.

Dewar Flasks

It will thus be seen that the problem resolves itself largely into one of relative accessibility of the works at which the liquid or gas is produced. There can be no doubt, however, that it would pay large consumers of oxygen to put down their own plant for producing liquid if their supplies of oxygen have to come any considerable distance from the oxygen works. We believe that the present manufacturers of compressed oxygen would be willing to supply it in liquid form at an economical price if there were sufficient demand for it.

In its earliest days, liquid oxygen was stored only in small quantities in glass vacuum vessels invented by Sir James Dewar and generally called "Dewar" flasks. These flasks consisted of two concentric glass vessels, the space between which was evacuated, the inside of the outer vessel and the outside of the inner vessel being silvered, and are now familiar commercial articles in great evidence at picnics.

The vacuum jacket provides the best known means for heat insulation, and thus prevents heat from getting readily to the extremely cold liquid air or oxygen contained in the flask. Such glass flasks can, however, be made only in comparatively small sizes and are very liable to fracture in use.

Tests have been made of a very large number of these flasks, some made of special refractory glass with a view to resisting the heavy strain of the great temperature variation; these tests show that it is very difficult to obtain a glass vessel which will resist pouring out or in of the cold liquid for many times even under the careful handling obtainable in a laboratory. Under commercial conditions the use of glass vessels appears to be quite impossible in view of their liability to breakage and consequent danger of damage from the escaping liquid. Silica flasks have been tried with greater success as regards fracture, but they are very expensive and present greater difficulty in "holding" the vacuum.

The Germans appear to have been the first to manufacture on a commercial scale metal vacuum vessels for holding liquid air. In these vessels it is very difficult to retain the vacuum, and little success in this direction appears to have been achieved by the Germans, until they made use of an invention by Sir James Dewar, according to which charcoal is placed in the vacuum space, so as to be maintained approximately at the temperature of the liquid oxygen.

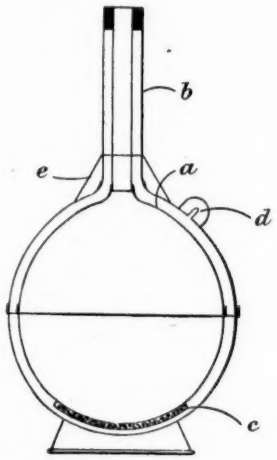
During the war a demand arose in this country for a large number of metal liquid air containers and a considerable number of them were made with very successful results, comparing very favourably with the best containers previously made in Germany. These German containers were imported into this country before the war for use in mine-rescue stations.

Metal Containers

In the most satisfactory form of metal liquid air container made up to the present, the construction is as shown diagrammatically in Fig. 1; copper and brass are the usual metals employed, and what we may term the standard size holds 5 gallons or 50 lb. of liquid.

The inner vessel *a* is suspended in the outer shell *b* by

means of the neck, and charcoal is contained in a cup *c* in contact with the bottom of the inner vessel. The space between the two vessels is connected by means of a lead tube *d* to a vacuum pump. When the desired degree of exhaustion has been attained, the tube *d* is sealed off and a cap is usually soldered over it to prevent its being damaged in use. A supporting cone *e* prevents the container from being overstrained at the neck.



Meticulous care has to be exercised at all stages of manufacture of these containers in order to obtain successful results. As will be seen from the illustration, the body portion of the inner and outer cases consist of hemispherical bowls soldered along their meeting edges, the diameter of the outer bowl being about 15 in. The bowls are spun from sheets which have to be selected with great care to eliminate the development of hair cracks in the process of spinning, and a special solder has to be employed which will stand low temperatures without disintegration. The inner surfaces of the outer bowls and the outer surfaces of the inner bowls are polished to a mirror finish, and every trace of oil or grease must be carefully removed. The inner neck tube is usually made of German silver on account of the small thermal conductivity of this metal at low temperatures.

Liquid air containers are never filled quite to the top of the spherical portion. Loss of heat takes place by radiation across the vacuum space and by conduction up the neck.

Since it is essential to maintain practically a perfect vacuum in the space in order to keep the container efficient as a heat insulator, it will be seen that great care has to be taken in the spinning, tube drawing, and soldering operations. The use of Sir James Dewar's invention of a charcoal layer has enabled a very great improvement to be made under manufacturing conditions. There are special technical difficulties in the production of high vacua. To ensure success in a container a pressure equivalent to not more than about one-thousandth of a millimetre of mercury must be reached and maintained. The charcoal appears to possess the property at this low temperature of absorbing the gases occluded from the pores of the metal after the connection to the vacuum pump has been sealed off, and it thus prevents these occluded gases from destroying the vacuum.

In a container of the size indicated, the loss of liquid by boiling off or evaporation can be reduced to about 4 lb. per day, so that some liquid can be kept for a fortnight. Some idea of the efficiency of such a container may be obtained by remembering that this is equivalent to keeping ice for a fortnight in an atmosphere at a temperature of more than 200°C.

Mathews Patent Roller Spiral Chute

To the Editor of THE CHEMICAL AGE.

SIR,—In connection with the publication in THE CHEMICAL AGE of May 1 of the proceedings at the Birmingham Conference, Chemical Engineering Group, I should like to bring to your attention what appears to be a misunderstanding by your correspondent.

As the author of the sixth paper read at the Conference it fell to me to exhibit a few lantern slides showing various types of package conveyors, one of which dealt with the lowering of oil barrels by means of the Mathews' Patent Roller Spiral Chute. Quite undeservedly, and surely purely through misunderstanding of its principles, this appliance is likened to something which in your correspondent's words "seemed to be a combination of a helter skelter lighthouse and Hampton Court maze," while its "appearance" is labelled as "suspicious."

I am rather surprised at such definitions when applied to a type of appliance, of which hundreds are to be seen in England. The fact that their use is almost common knowledge constituted my reason for not going into a lengthy verbal explanation at the Conference. Contrary to the impression received by a perusal of your correspondent's description, barrels actually travelling on the Spiral Chute really do not look "incongruous" or "undignified"—if a barrel can look otherwise—as the gradient at which the track is set is uniform throughout and enough only to cause the barrels slowly to descend by the force of gravity.—Yours, &c.,

147, Upper Thames Street, HY. VARNDELL.
London, May 18.

[What appears to Mr. Varndell to have been unfavourable criticism was nothing worse than excessive light-heartedness on the part of our correspondent. No disparagement, we are sure, was intended.—ED. C.A.]

Government Securities and Income Tax

To the Editor of THE CHEMICAL AGE.

SIR,—In connection with the new issue of Treasury Bonds it is presumed that tax on the interest will be deducted at the full rate before payment, as no mention is made of any concession on this point.

Under the Budget proposals the first £225 (after allowances for wife, child, dependent relatives, &c., have been made) is charged at half-rate, and the balance at full rate. It will, therefore, be necessary to claim repayment, as heretofore, if either no tax is payable or full tax is deducted but not payable, an operation which must necessitate a large revenue staff to deal with the thousands of claims, apart from the hardships suffered by those who are temporarily deprived of part of their income.

As is well known, interest on some Government securities is deducted before payment, in other cases the person is assessed, whilst in yet others no tax is suffered or paid; furthermore these different methods are still more complicated by the nature of the holding of each security deciding whether tax is deducted or is to be paid direct by the taxpayer.

It appears to me that the hardship might be reduced almost to a minimum, and a great saving of Government expense in connection with repayments might be effected if this simple scheme were adopted, viz.: Deduct tax at half rate on payment of *all* interest in cases where the income requires it.—Yours, &c.,

67-68, Cheapside, W. R. FAIRBROTHER,
London, May 18. Income Tax Specialist.

Electric Furnace as Applied to Metallurgy

WE have received from Arthur D. Little, Inc., chemists and engineers, Cambridge, Mass., No. 4 of their Bibliographic Series. Under the title of "The Electric Furnace as Applied to Metallurgy," this volume contains a list of magazine references on the construction and operation of the electric furnace as applied to the metallurgy of iron and steel and the non-ferrous metals. An attempt has been made to include all the important references since 1900, at which time the electric furnace was becoming established in the iron and steel industry. Since 1907 the reference to Chemical Abstracts is given in addition to the magazine references, to enable readers to eliminate many of the references given as unsuitable for their particular needs. Criticism of the arrangement of the volume is invited.

Electrical Osmosis

Possibilities of Commercial Application

THE commercial application of electrical osmosis formed the subject of a paper before the Royal Society of Arts on Wednesday, May 19, the authors being Mr. J. S. Highfield, Dr. W. R. Ormandy and Mr. N. Northall-Laurie. It was pointed out that the study of matter in the colloidal state was receiving increasing attention, and the importance of it was emphasised by reference to the large number of industries which depended upon the use and proper treatment of matter in the colloidal state. The term colloid or matter in a colloidal state—true solution and suspension—is not easy of simple definition; but the authors defined it, for their immediate purpose, as matter in so fine a state of subdivision that it tended, under favourable circumstances, where coalescence did not readily take place, to remain for some hours in suspension. After tracing the origin of the term osmosis, and defining it as a general pushing, such as the diffusion of liquids through a diaphragm, the paper briefly mentioned the first work in regard to the electrical properties of colloidal solution, by which it was found that matter in colloidal suspension, when subjected to direct current of upwards of 60 volts between platinum electrodes, tended after a time to collect, either around the anode or cathode, leaving a clear space around the anode or cathode respectively. The polarity of the particles depended, not only on the constitution of the particles, but on the nature and quantity of electrolytes present, and also upon the composition of the medium in which they were suspended. Thus, silicic acid was charged positively when in water and negatively when in turpentine.

The special application of the principles of electrical osmosis dealt with in the paper was the purification of clays and similar materials. The commercial application of these phenomena to the purification of clays was due to the late Count Schwerin, who showed that the addition of small traces of alkali to a suspension of clay in water resulted in the suspension becoming highly mobile, the clay particles remaining for a long time in suspension, and the pyrites, mica, free silica and other impurities tending to fall through the suspension. At the same time, certain fine impurities remained, and were carried down with the flocculated clay, so that only partial purification was obtained; moreover, the physical state of the clay was entirely altered, and the clay was left in a form difficult to collect and dry. For these reasons the electrical method of purification was developed. If, in the prepared suspension, two electrodes were immersed, and a difference of electrical potential established between them, the clay particles moved to the anode, where they discharged themselves and adhered as a coagulated mass, and the water was driven to the cathode, leaving the clay in a semi-dry state attached to the anode. The fine particles of silica, mica, pyrites and other impurities either migrated to the cathode or were washed away by the stream moving to the cathode. The effect of the practical application of the process on clay was to remove the particles of mica, silica, pyrites and felspar, and to leave the clay substance in a satisfactory state for final drying. The effectiveness of the purification was seen in a large number of photo-micrographs and samples of the material in both states were exhibited.

The form given to the apparatus for the commercial purification of clay consisted of a tank containing in the lower part two paddles, which served to keep the suspension in agitation, and direct it in a stream through the numerous small spaces in the cathode fixed immediately above, and which surrounded the lower half of the anode. The anode consisted of a metal cylinder revolving at a speed of about one revolution in three minutes, at a distance of about three-quarters of an inch from the cathode. A scraper removed the clay from the anode, whence it fell down a shute clear of the machine. A fresh clay suspension was fed into the lower part of the container, and the water effluent returned to be mixed with fresh clay. The manner in which the machine acted towards the clay was as follows: The clay in suspension in passing through the laminated or perforated cathode became negatively charged, and was immediately attracted to the anode cylinder, the water being driven towards the cathode. There was thus obtained a dry layer of clay on the anode cylinder, and a watery zone of clay suspension round the cathode. Fresh clay entering the machine encountered the water zone on its passage to the anode, in which zone the electro-osmotically indifferent particles, such as pyrites, mica and quartz became freed from the clay and were washed away. The effluent with these particles also contained some clay. It was carried to a settling tank, where the impurities quickly settled out and thence to a plunger or other mixing machine where it took up fresh clay and returned again to the machine through one or more settling tanks.

The clay left the machine in the form of a blanket from one-quarter to one-half inch in thickness, from which all the water had been driven except 25 per cent., and in this form admitted of ready drying when required. The process was extraordinarily flexible, and lent itself to the treatment of many varieties of clay from which many different products were obtained. From some marls and fireclays considerable quantities of pyrites were obtained, and from others silica in a very finely divided form was separated. From China clay deposits exceedingly fine mica and sand were obtained. The cost of working varied widely according to the class of clay treated. The electricity used varied from as low as 20 up to 70 units per ton of machine product.

Another application of electro-osmosis was the electro-osmotic filter press, which had been developed for the de-watering and purifying of many substances in a finely divided state. The press in its simplest form consisted of a series of chambers, into which the suspension was fed under a head of, say, 10 ft., sufficient to secure a rapid filling of the chambers. The chambers were closed on both sides by filter cloths in the ordinary way, but the cloths were held in position by perforated or grooved metal or carbon or other conducting plates, one of these plates forming a cathode and one an anode. An electrical pressure of 20 to 100 volts, depending on the substance to be filtered, was established between the plates, and the water was forced towards the cathode. In this press materials could be de-watered which were difficult to filter in the ordinary pressure press.

Obviously, the application of the principles of electrical osmosis were by no means confined to the purification of clay, but it was to this that the paper was confined.

Discussion

Sir Herbert Jackson said that when he went into the question of getting something better than ordinary clay for making crucibles for the manufacture of optical glass in the early days of the war, the advantages of treating clay by this process were obvious and clear. He found that, instead of getting a life of 24 hours, as was the case with the ordinary clay crucible, he got anything from ten to fifty times as long a life. As an instance of this, he showed a crucible made of osmosed clay which had been heated to a temperature of from 800°C. to 1,000°C., in which had been placed a small crucible made of ordinary clay, and at this temperature the ordinary clay crucible had fused, and was seen at the bottom of the osmosed clay crucible. The process produced a material of great stability, both mechanically and chemically, and when at the beginning of the war he had found great difficulty in producing optical glass owing to difficulties with crucibles, he had been very pleased when Dr. Ormandy and Mr. Highfield took the question up and developed the process.

Mr. Walter Hancock looked to the process as being of great assistance in enabling us to get some of the world's trade in high grade optical glass, which we were in fact now doing. Success in that direction, however, depended solely upon being able to get a better high grade refractory material than had been available up to the present. Hitherto we had been content to take the raw material almost as it was mined, because our methods of purification were very primitive; but the paper had shown what a great advance upon those methods this process of osmosis was. Clay treated in this way was capable of resisting high temperature on the one hand, and chemical action on the other, to a far greater degree than ordinary clay.

Mr. Murray Morrison said he had had a large number of samples of glass treated in this way through his hands, and foresaw very large applications for it. Crucibles in glass making were an expensive item, and the life of them would be considerably extended by the use of the osmosed clay, whilst there were many obvious applications in other directions.

Mr. W. H. Patchell said that he had called attention to the process in this country in 1910; but, in spite of getting samples of osmosed clay from Count Schwerin in Germany, the process

was turned down in this country because we did not appreciate the advantages of such high-class material. Cornishmen would not take it up, but when the war broke out he again brought it forward, and called Sir Herbert Jackson's attention to it.

Captain C. J. Goodwin said he did not think it was any great secret that Dr. Ormandy and some of his colleagues had been to the Continent since the war, and he would like to have some information, if possible, as to whether the process was making rapid progress there. Apparently on this side it was in its infancy. There seemed to be an opening for the application of the process to the drying of peat, the use of which in the present coal shortage was an important matter. particularly in some of the Continental countries, like Italy. If the lignites and peat of Italy and elsewhere could be treated by this process, it offered a profitable business. The same thing applied to many chemical wastes and by-products, in particular sewage and similar effluents, in connection with which at present considerable use was made of centrifugal machines and centrifugal filters. It would be of interest if some information could be given as to how the cost compared in the two cases. Then there was the question of the conditions under which the process could be applied. The authors had dealt almost exclusively with suspensions in water, but he would like to know if the process could be applied to materials suspended in other liquids, such as ferric hydrate in caustic soda solution, or possibly arsenical suspensions in sulphuric acid. There was also the time factor. In the experiment made that evening it was noticeable that the clay separated out very rapidly, but he would like to know whether the rate of separation varied with different materials. At the present time a great deal of interest was being taken in coal dust and other combustible materials in oil, which was known as colloidal fuel, and the process of osmosis might have an important application in this connection.

The Authors' Reply

Dr. Ormandy, replying to the discussion, also referred to the longer life of muffles, in glass making, composed of osmosed clay, and drew special attention to the manner in which the process rejected the impurities, and produced a product far superior to that obtained with the present methods of centrifugal washing. The advantage of this very much purer clay for crucibles and muffles, especially in glass making, was not only mechanically, but also chemically, as it was necessary to prevent any of the clay substance entering the mixture which was being melted. In the manufacture of commercial glass, also, there was a great field for the process, because our glass industries had always been handicapped by the quality of clay they had to use, and in the past the Continent had been far ahead of us for this reason. The application of scientific methods must take place in the clay industry, and whilst in the past there had not been a great desire on the part of the user to demand these high-grade clays, at the same time he felt it was necessary to educate the directors of some of our manufacturing firms, not only to say what a fine thing science was, but to apply it in their businesses, and scrap some of the antiquated methods now employed. The public in the past had not realised the advantages of using a scientifically pure product, but that was partly because the manufacturers themselves had not developed on the right lines. The process was first invented on the Continent, and there had, consequently, been more time to develop it there. There were already at work in Austria very large china clay works turning out from 60 to 70 tons per day on this process; fireclay works at Klingenberg, where there were several machines on the process; in Coblentz plant was being erected; and even in Spain works were being put up to operate the process. If we did not take care, Spain, which was not usually looked upon as a pre-eminently scientific country, would get there before we did. With regard to treating peat by the process, considerable attention had been given to this, and he thought that the osmosa filter press offered greater advantages than any other method yet put forward for treating commercial peats which could neither be centrifuged nor pressed. The bulk of our peats in this country were of this nature. Probably Mr. Highfield would shortly be able to deal with that subject in another lecture. Experiments with sewage had been made, but one of the troubles was that, whereas clay consisted of particles which would go definitely to one pole or the other, sewage consisted of such a mixture of material that there were some portions which had no electrical property at all, and further research was necessary in this connection. As to the conditions of use of the process, solutions of soluble salts did not offer such a ready means as water, because they would carry away the current, and until it was possible to remove the electrolytic salts first, and then deal with the suspended matter in the same way as clay, he did not think the process could be directly applied in the manner mentioned by Capt. Goodwin. As to the rate of separation, there was an economical limit which it did not pay to exceed. A machine 5 ft. long and 2 ft. diameter would turn out 1,000 tons of clay a year, working under ordinary commercial conditions; but the rate was conditioned to a certain extent by the electrical pressure. The figure for the various clays seemed to be about the same, but the purer the clay the greater the output.

Mr. Highfield, who also briefly replied, dealt only with the question of peat. There was no difficulty in drying peat, but commercial considerations came into play in other directions. The cost of transport of the peat to the plant was a serious item, as it was not, in the nature of things, possible to keep the plant at the point where the peat was dug. The source of supply was necessarily always getting further and further away from the plant, and that raised the whole question of the commercial possibilities of treating peat.

Swiss and German Dyestuff Profits

THE report just issued by the largest of the Swiss coal-tar colour firms, the Society for Chemical Industry, Basle, shows a net profit of £345,000, as against £248,000, and proposes a dividend of 15 per cent., as against 27½ per cent. last year. In addition a free bonus share is being allotted in respect of every three shares already held. The capital will then amount to £800,000.

The balance-sheet just issued by the Badische Anilin und Sodafabrik, Ludwigshafen, one of the large German concerns, shows a net profit of £1,350,000, as against £542,000 last year. It is proposed to pay a dividend of 18 per cent., as against 12 per cent. The capital is £5,625,000, as against £4,500,000, and it is proposed to raise it to £9,000,000. The report states that the works at Ludwigshafen and Oppau were closed from November, 1918, to June, 1919, owing to lack of coal, and since then only a small part of the plant has been working. Owing to the fall in the exchange value of the mark it has been possible to dispose of their stocks of dyestuffs to foreign buyers at prices which yielded handsome profits. Towards the close of the financial year the Ludwigshafen plant for colour making had again to be dropped owing to the coal shortage, but it was possible to keep the acid plant working, and so maintain the production of the nitrogen factory.

The balance-sheet issued by the chemical works formerly Weiler-ter-Meer, Uerdingen on the Rhine, shows a net profit of £129,000, as against £57,000 last year. A dividend of 12 per cent. is being paid, as against 10 per cent. The firm of Kalle & Co., Biebrich-on-Rhine, is paying 14 per cent., as against 7 per cent. last year. Profits are all estimated at the pre-war rate of exchange.

Naphtha or Tar Oil?

THE Railway and Canal Commission Court, presided over by Mr. Justice Lush, on Thursday, May 13, concluded the hearing of the claim of the Midland, Great Western and Lancashire & Yorkshire Railway Companies against Messrs. Brotherton & Co., Ltd., of Leeds and Liverpool, and Messrs. William Butler & Co. (Bristol), Ltd., for a declaration that the product from the coal tar distillery works of the defendants, consigned by them as tar oil, is naphtha, and should be classified as dangerous goods. (THE CHEMICAL AGE, May 15.)

Mr. Eustace Hill, K.C., for the railway companies, contended that the evidence bore out what they claimed—namely, that this commodity was naphtha, and should be classed as dangerous goods.

Mr. Justice Lush said if the Court were in favour of the railway on the point that they *bona fide* believed it was dangerous he would personally be prepared to make a declaration which might give them all they wanted. But it would be quite different from finding as a fact that this commodity was dangerous goods.

Mr. Hill: Then that is what I ask.

Mr. Justice Lush.—We will reserve our judgment, but we hope to give it this day week.

The Chemical Industry Club

"What is a Chemical Engineer?"

THE last monthly meeting of the Club for the 1919-1920 session was held on Monday evening, and attracted a large and distinguished audience. Mr. A. Gordon Craig was elected to the chair, and a discussion on "What is a Chemical Engineer?" was opened by Mr. Harold Talbot, hon. secretary of the Chemical Engineering Group of the Society of Chemical Industry.

In the course of his opening remarks, Mr. Talbot stated that, although in the past, and even at the present time, the exact meaning of the term "chemical engineer" had been the subject of fierce argument, yet there was a steadily growing number of people—including even women—who called themselves "chemical engineers," and from his official connection with the Chemical Engineering Group he had been interested in noting the various qualifications upon which the members of the group based their claim to the title. Mr. Talbot mentioned that he had critically examined some 700-800 of the lists of particulars furnished by members of the Chemical Engineering Group, and, without venturing to claim that there was any connection between such membership and the consequent use of the label "chemical engineer," he had been interested to note the fundamental points in which the experience of his fellow-members agreed. These were two in number—firstly, the people who styled themselves "chemical engineers" had invariably experience in a chemical works, or in a works where the raw material of manufacture underwent some chemical transformation as opposed to mere change of form, and, secondly, these same people were directly associated with the "works," or commercially productive side of the manufacture, and not at all directly with the research or routine laboratory aspect of the industry.

Mr. Talbot's Definition of a Chemical Engineer

Using these two basic facts as a foundation upon which to rest his definition, he submitted that a chemical engineer could be defined as one who designs, erects and directs the working of plant for the carrying out of chemical reactions on a commercial scale. Mr. Talbot proceeded to elaborate this definition, and pointed out the very limited extent of the ordinary mechanical engineer's experience compared with the range of working substances, temperatures and pressures met with in chemical engineering practice. He also drew attention to the ignorance of the usual type of research chemist when confronted with problems in economic production, and gave amusing illustrations of his statements.

Finally, he reminded the audience of the importation of chemical engineers with foreign training and experience to organise the manufacture of high explosives during the late war, and expressed the opinion, based on statements in the report of the British Chemical Mission to Germany, that the chief reason for the success of the German chemical industry lay not so much in the chemistry of her manufactures as in the chemical engineering. He closed by giving the opinion of a distinguished member of the Government Department of Scientific and Industrial Research, that "the future industrial success of this country lies almost entirely in the hands of the chemical engineer."

Discussion

The discussion which followed was very varied in range and relevancy, though at all times interesting. It was significant to note that there was practically no opposition to the use of the terms "chemical engineer" and "chemical engineering," as would have been the case, say, twelve months ago. Even the apostles of the label "engineering chemist" were almost silent, the only disputant who suggested this alternative title being effectively disposed of by Mr. Talbot in his reply. "Call a man any kind of 'chemist,'" said Mr. Talbot, "and he is damned for all time, but call him a species of 'engineer,' and the man in the street looks up to him, whilst even members of the Government think they understand the importance of his business." We are inclined to agree with Mr. Talbot in his choice of name, although, perhaps, not exactly for the same reasons.

Some of the speakers emphasised the importance of physics in the training of a chemical engineer, this subject in its more recondite aspects having far greater bearing on his work than in the case of the ordinary mechanical or other variety of engineer. Illustrative examples were cited, the most notable being the extremely wide range of problems in heat transmission which confront the chemical engineer, in the handling of which he is on entirely new ground, and is only slightly assisted by the knowledge and experience drawn from ordinary steam engineering theory and practice. Mr. Talbot laid stress on this last point in his reply, and stated, moreover, his firm opinion that chemical engineering was neither a branch of chemistry nor a branch of engineering, but a science to be taught and a profession to be practised, of such increasing and immediate importance to this country as to invite the close attention of all who had the nation's welfare at heart.

A very hearty vote of thanks to Mr. Talbot at the close of the discussion brought an interesting and instructive meeting to a close.

Industry and Science

DR. A. W. CROSSLEY, director of the British Cotton Industry Research Association, in the course of an address at the third conference of the Research Association on Friday, May 14, (the Marquis of Crewe presiding), pointed out that all great industrial advances had been the outcome of pure scientific research work. Rule of thumb had carried many industries to extraordinary success in the past, but there came a time when rule of thumb failed to make advances, and when it became essential to know the scientific why and wherefore. One of the greatest chemical manufacturing magnates in the world declared in 1914—and the words were true to-day—that scientific research work carried out in the laboratory, was the soul of industrial prosperity. In the past, it had been considered undignified for a professor to have something to do with trade, and many professors were bound by agreements which precluded them from any co-operation in trade work. A professor might not approach that awful thing known as a "patent" without himself and his institution becoming defiled. He was, nevertheless, entrusted with the duty of training students who would go into the industrial world as scientists. It appeared that, through the research associations, this misunderstanding could be rectified, and that the associations could provide the link that had been missing in the past from the educational chain in this country.

A New Canadian Chemical Enterprise

CHEMICAL PRODUCTS, LTD., have secured the Trenton (Ontario) plant of the British Chemicals, Ltd., which was operated during the war for the production of acids and explosives. It covered some 250 acres, but was partly destroyed by fire. The new company are prepared to manufacture 75,000 tons of acid phosphate per annum, and expect to engage in the production of acids, both sulphuric and nitric. The plant has been rearranged into four units, where the following operations will be undertaken in a very large way :—

Plant 1. Production of sulphuric acid and acid phosphate; production of nitric acid for general purposes.
Plant 2. Refined nitrate of soda; magnesium sulphate.
Plant 3. Salicylates and derivatives.
Plant 4. Ammonia and coke-oven by-products.

The Directors who have organised this company are: R. J. Copeland (Copeland-Chatterson, Ltd., New York); D. M. Sanson (Graham-Sanson Co., Toronto); R. J. Cluff (Chase Tractors Corporation, Ltd., Toronto); J. C. Graves (Saginaw Chemical Co.); T. E. O'Reilly (Toronto); W. H. Van Winkel (Aniline Dyes and Chemicals, Inc., New York). Plant operations will be in charge of Mr. A. H. C. Heitman. The financial agents are Graham, Sanson & Co., Toronto.

Arsenic and Antimony Ores

PROFESSOR HENRY DEWEY'S report on Arsenic and Antimony Ores (the latest addition to the series of Special Reports on the Mineral Resources of Great Britain, issued by the Geological Survey) is necessarily brief, though the subjects are treated quite thoroughly. In the case of each metal there is given a general account of the mode of occurrence and of the distribution of its ores, followed by a detailed description of all the mines that have produced any noteworthy quantity. There is practically no antimony at all produced in Great Britain, but Cornwall and Devon still rank as relatively important contributors to the world's output of arsenic, much of this being obtained as a by-product from Cornish tin-mines.

The Economic Status of Chemists

A Survey of the Situation

IN the current issue of the *Journal* of the Institute of Chemistry further attention is given to the question of the economic status of chemists which the president discussed in his address to the annual meeting. The tendency, it is stated, to quote glaring examples of unsatisfactory conditions as if they were the general rule, has created an impression which is not entirely borne out by the facts, and there is a danger that, by holding these out as the rule when they are really the exception, the value at which the services of the chemist are even now assessed may be misrepresented to his disadvantage. It is proposed, therefore, to follow a little further the line indicated by the President and to take a survey of the situation.

Apart from the conditions arising from the war, the present position of professional men, as a whole, is attributable in a large measure to their callings becoming overcrowded, and this, in turn, is due to the provision of free education whereby many who could not at one time have aspired to professional work have attained a higher social standing than would otherwise have been their lot. In spite of the fact that the opportunities in professional work of rising above a certain salary, say £750, are fewer than in commerce, overcrowding prevails in all professions, especially in the modern professions, in which, at present, there is no statutory restriction of practice, and for which our educational system has been developed by the provision of secondary and technical schools. Moreover, the higher appointments in such professions fall not always to the most expert, but often to men possessing character and personal qualifications, which, to a considerable extent, compensate for less marked ability in their particular work. This applies in all professions and should be borne in mind by parents whose boys aspire to professional work.

With these considerations in view the question arises—What part can professional bodies take in assuring employment to any surplus of qualified men and in assuring remuneration commensurate with the necessary education and technical training? That the Institute has taken its part to some purpose has been clearly substantiated by the figures given by the President, which show that less than one per cent. of the members are at present without appointment; while one of the main reasons for the success of the Institute in securing appointments for its members is the recognition accorded by employers to the Institute's guarantee of competency.

The problem of disposing of the surplus in the future, in view of the very large number of chemists likely to qualify in the next few years, is, however, an extremely serious one, since it is doubtful whether the chemical industry of the country will develop rapidly enough to absorb the greatly increased supply of qualified men which will become available. If, then, as may be expected, only chemists of the highest attainments, both scientific and personal, have a prospect of securing satisfactory appointments, the necessity for individual effort is obviously imperative. The Institute is taking every step possible to promote the further employment of chemists in the development of the chemical industry of the country, but it seems necessary to sound this note of warning.

The prevailing ignorance on the part of the general public of the functions of the chemist is largely due to the fact that, in the past, he has restricted his operations within the four walls of his laboratory rather than applied his talents in a wider sphere of activity. There has been little tendency on the part of chemists to make use of their knowledge in commerce or in administrative work; but the leavening by chemists of occupations hitherto not actively connected with chemistry would often be advantageous, not only to the individuals, but to the community. Any who have distinct aptitude for business should therefore be encouraged to exert themselves in that direction, since their technical knowledge should give them an advantage over their less-informed competitors.

With regard to the second part of the question, the data published in Part I. of the *Journal* afford only a rough basis on which to consider whether the remuneration of chemists is, or is not, reasonable; but the information given should enable many members of the profession to see how they stand, and to take steps to improve their positions. Had the replies received in answer to the circular issued in August, 1919, been more representative, the data, in all probability, would have revealed a more satisfactory state of affairs; it might have been expected also that, on the publication of the data, many of the less fortunate chemists would have taken the advantage of the facilities afforded by the Appointments Register, yet this has not been the case: on the contrary, the number of members using the Register has since decreased.

Supposing, however, that the position in which the majority found themselves were such that collective action of some kind became unavoidable, what part could the Institute take? The suggestion that chemists, as professional men, should strike in order to obtain more satisfactory conditions of work and remuneration has been repudiated by all organisations concerned. What, then, is the alternative? Chemists who are deserving of more substantial recognition than they receive must do all they can to prove it by showing that they can do better elsewhere. The Institute helps them to do this by means of the facilities afforded by the Appointments Register, and they are urged to take advantage of those facilities, both in their own interests and in those of the general body.

Employers, it is true, are not always alive to the value of the services of their chemists; but the efforts of organised bodies will never convince the employers on these matters unless such efforts are supplemented by initiative and enterprise on the part of the individual members of such bodies. The majority of Fellows and Associates are doing well in the profession; and, notwithstanding the published data, the discontent of which so much is heard is now thought to be, in reality, less prevalent than was supposed. The men occupying leading positions in the profession are by no means unsympathetic with the aspirations of the younger men, but look to them to take their part in maintaining the position of chemists as professional men, who can approach their employers on terms of equality—the attitude which the employers themselves, in most cases, wish them to adopt. It is well to remember that for many years the founders of the Institute developed the professional status of chemists and were actuated by ideals which aimed at forming a body of men commanding the respect of the public and capable of maintaining the dignity and welfare of their profession. These ideals must be upheld.

Society of Chemical Industry

M. Paul Kestner Awarded the Medal for 1920

THE Council of the Society has awarded its medal for the year 1920 to Monsieur Paul Kestner, in recognition of his distinguished services to chemical industry. Monsieur Kestner was born in Alsace prior to the German occupation in 1871, and although most of his life has been spent in France, he lived for several years in this country, and has been a member of the Society since 1893. He was one of the chief founders and the first president of the Société de Chemie Industrielle in France, which was established in 1917. He has been connected with engineering as applied to chemical industry throughout his career, and among his more notable achievements are the use of forced draught in acid towers, automatic acid elevators, the climbing film evaporator, the scale-less water-tube boiler, and several inventions in connection with beet-sugar manufacture. Very shortly before the armistice M. Kestner gave an address of outstanding interest and importance to the London Section of the Society on "The Alsace Potash Deposits and their Economic Significance in relation to Terms of Peace."

The previous recipients of the Society's medal have been: 1896, Mr. John Glover; 1898, Dr. W. H. Perkin; 1900, Dr. Edward Schunk; 1902, Sir J. W. Swan; 1904, Professor Ira Remsen; 1906, Dr. Ludwig Mond; 1908, Sir Andrew Noble; 1910, Mr. Thomas Tyrer; 1912, Sir William Crookes; 1914, Right Hon. Sir H. Roscoe; 1916, Mr. C. F. Cross; 1918, Sir James Dewar.

The Salters' Institute

The SALTERS' INSTITUTE OF INDUSTRIAL CHEMISTRY invites applications for fellowships of the annual value of £250 from those who in October next will have completed three years' training in chemistry and desire ultimately to enter upon an industrial career. The applications, including particulars of the candidates' training and war service, must be sent to the director of the institute, Salters' Hall, St. Swithin's Lane, E.C. 4, by, at latest, July 1.

The Pumping of Oil Wells

The Air-Lift System

BEFORE the Institution of Petroleum Technologists on Tuesday, Mr. R. Stirling, in a paper on "The Air-Lift System of Raising Oil," said that the air-lift system differed from all other systems of raising liquids by means of compressed air, in that the action depended solely on the aeration of the discharge column of liquid. The weight of this column must, in order to obtain the discharge, be lighter than the column of liquid in the well, so that by no possibility could any additional pressure be put on the strata in the well. Failure to realise this fact had given rise to one of the chief arguments against the use of the air-lift in oil wells, that the compressed air would drive the oil back into the oil sands, or into other porous strata. The air-lift, properly applied, was the most advantageous method of raising the oil from all wells yielding sufficient liquid for the continuous working of an apparatus of the smallest practicable capacity. It was particularly advantageous for wells which had ceased to flow naturally, and either flowed intermittently or not at all, because by the air-lift much larger yields could be obtained than by any other system of pumping. Any gas present with the oil assisted the air-lift by reducing the quantity of air required, and the energy of the gas now wasted was thus utilised. Where the oil was found in loose sands which entered the well with the oil, the air-lift was the only practicable means of raising the sand with the oil, and so keeping the well always clear to the bottom, and thereby securing the maximum yield from the well.

Screens to prevent the sand entering the well were worse than useless, because, unlike water, oil, on account of its viscosity would not wash out the mud and fine sand, which packed outside the screen, and became impermeable to the oil. The sand could not be extracted by the ordinary oil well pump, with the working of which it so seriously interfered that the pump must be placed some distance above the bottom of the well, so that most of the sand might settle out of the oil before reaching the pump. This sand gradually accumulated and prevented the free influx of oil to the well, so that the yield steadily diminished, until the maximum payable yield was reached, when the pump must be withdrawn and the sand removed by sand pump, causing a further loss of production while the operation was being carried out, besides the cost of the work.

The Baling Method

The only other method besides the air-lift of raising the sand with the oil, and so keeping the well clear, was that of baling as developed in Baku, but, besides being too cumbrous and uneconomical to bear comparison, this method necessitated wells of large diameter, if even a moderate production was to be obtained. The theoretical advantages to be obtained from the use of the air-lift for pumping the wells in Baku, where the loose sand trouble prevailed, were so apparent that a systematic application of the system was started in 1901. In that year the air-lift system of pumping was successfully applied to several wells. The first well, No. 24 Bibi-Eibat of the Russian Petroleum & Liquid Fuel Co., was 358 ft. deep, and the oil stood at 600 ft. from the surface. The daily production by baling had averaged 1,200 poods during the previous year, but by air-lift the yield of oil averaged 12,000 poods per day during six months. The oil was taken from below the casing shoe, but the compressed air was introduced higher up, the working air pressure ranging from 160 lb. to 110 lb. per square inch during the period. Altogether over 50 wells were experimented with during the three years 1901-4, all damaged wells or flooded by water, and many interesting facts were revealed. It was clearly proved that there need be no fear that the air-lift intelligently applied would damage a good well, although it might disclose and even aggravate defects in a defective well. It had been objected that in obtaining a greater production from a well the level of the liquid in the casing would be lowered to such an extent that the casing might collapse, but it was necessary to lower the level to induce a greater influx of oil, and if the casing were defective it might collapse.

Unless, however, the lecturer stated, the casing were capable of withstanding the greater pressure to which it must be subjected by the lowering of the level of the liquid, there could be no hope of getting the increased production by any means. Moreover, the level of the liquid in the well would fall in any case sooner or later, as the oil became exhausted, and eventually the casing would be called upon to withstand the greater pressure. As a matter of fact, the casing was not collapsed or damaged in any of the wells tested, although the liquid level was lowered in some cases several hundreds of feet. A favourite argument against the use of the air-lift was that the inflow of the water was induced thereby. Of course, by lowering the level of the liquid column, pressure was removed from the liquid-bearing strata, and the liquids they contained, whether water or oil, if they had access to the interior of the casing, would enter in increased quantities. If both water and oil had unrestricted entrance to the casing, as when both came from a flooded oil stratum, both would enter in the same proportion as before, and the greater production of liquid obtained by the air-lift would carry a similar proportion of oil to that in the lesser production obtained by other means. An illustration of this was given when two adjoining flooded wells were pumped by air-lift. The oil in the liquid was 2 per cent., when 5,000 poods per day were raised by baling from one well, and when 20,000 poods per day were raised from each well by air-lift, as also when 40,000 poods per day were raised from one of the wells.

If the entrance of one of the liquids were restricted, as when one entered through a defective joint or hole in the casing, then the proportion of the liquid, the entrance of which was unrestricted, would increase in much greater proportion, and if this were oil the results might be quite satisfactory without the expense of shutting off the water. As illustration of the above, one well with damaged casing yielded by baling 1,500 poods of oil and 300 poods of water per day, but by air-lift 14,500 poods of oil and only 500 poods of water. When the air-lift was applied to another well the percentage of water increased greatly, but the quantity of oil was only slightly greater. It was diagnosed that the water entered from below the casing, and the oil from a higher level through a defect in the casing. A packer was placed in the casing near the bottom of the well with the result that almost pure oil was obtained, in quantity several times greater than before, the level of the liquid in the casing being lowered by several hundreds of feet. In another case the level of the liquid having been lowered by the air-lift, water could be heard cascading into the well. A packer was placed in the casing below the level reached by the liquid, and the well was pumped from below the casing shoe, with the result that it shortly began to flow and continued producing 8-15,000 poods of oil per day.

Effect of Heavy Viscous Oils

Only one disadvantage had to be recorded against the use of the air-lift in that with very heavy viscous oils, if over 5 per cent. and under 20 per cent. of water were present with the oil, an emulsion might be formed from which it was difficult to separate the water. Wells yielding oil with less than 5 per cent. of water were pumped without this trouble, and in a well with 10-15 per cent. of water the difficulty was overcome by running into the well an additional 20 per cent. of water. When emulsion was formed it could generally be easily broken up by mixing with a lighter oil from a neighbouring well. It was at first feared that the air might carry off some of the lighter constituents of the oil, but this had been proved, both in Baku and in Trinidad, to be groundless. The refineries reported that if anything the oil raised by air-lift retained a greater proportion of the lighter fractions, probably owing to the slight refrigerating effect of the expanding air.

The question would at once occur to most minds why with such satisfactory results the air-lift pumping of oil wells had since 1904 made little or no progress in Baku, and in other fields had chiefly been used to pump wells in water-flooded areas, merely because by this means a larger quantity of liquid could be pumped from a bore-hole of restricted diameter than by any other? The answer must be that the disturbances in Baku during the Japanese war dispersed the technical staff who had been engaged in solving the various problems, before the system had become established in general use. The apparent simplicity and ease of demonstration of the air-lift principle led engineers to take for granted that the design of an efficient apparatus was equally simple. Unsuitable designs were tried, unexpected and apparently inexplicable results were obtained, and the causes were confused with conditions pertaining to the particular wells. This might appear surprising, but a similar example was that of the centrifugal pump, the principle of which was so easily demonstrated. It

was in use for hundreds, perhaps thousands, of years for low lifts before its action was scientifically studied, and in consequence its efficiency improved so that to-day it was efficient for very high lifts. The steam turbine was another and more recent example.

In recent years the serious difficulties with the loose sands in some of the oil fields of Trinidad had proved such a handicap to their development that it was decided to use the experience gained in Baku to overcome them. The conditions met in the wells were very similar, although the application of the remedies were rendered much simpler on account of the use of screwed casing, and the rotary system of drilling being already established. These made it feasible to control the wells during the eruptive stages, when irretrievable damage was often done to a well, and systematically to apply the air-lift as the general system of pumping the wells. Already the success of the system had been clearly demonstrated, and the conditions prevailing in the wells discovered and met.

Oil well operators had been too apt to be content with a payable production from a well, without considering if, and how, the daily production and the total production of a well might be increased. As an instance of this take the example given of Well No. 24 in Baku. Everyone was satisfied with the production of 1,200 poods per day, and in fact the well which had been intended to tap a lower oil source was stopped at the higher sand, because the production was considered so satisfactory. It was only with serious misgivings that it was handed over for the air-lift experiment, yet it was found capable of yielding 14,500 poods per day, and actually yielded over 2,000,000 poods in six months, as compared with some 400,000 poods in the previous 12 months. Hundreds of wells in the field would have given equally good results, as was proved by the experiments on damaged wells, and wells giving unremunerative yield.

Air-lift Apparatus Accessories

The addition to the air-lift apparatus of a valve at the bottom of the discharge pipe was the vital improvement which made it applicable to wells containing loose sand without incurring the serious trouble of frequent choking of the pipes by sand. The necessity for such a valve at the bottom of the well was clearly indicated by the experiments carried out in Baku, but the idea was only crystallised later, and the present design evolved and described in the patent granted in 1917 (British patent No. 117,567, and U.S.A. No. 1,279,783). This foot valve, which could be fitted to the rotary system drill stem, enabled a well to be drilled into an oil sand with gas under high pressure, so that an unrestricted flow with the consequent disturbance of the strata in the vicinity of the borehole could be prevented, and the flow when permitted, which was now generally interrupted by the choking of the pipes with sand, could be maintained uninterruptedly by the application of compressed air with the air-lift apparatus. The general experience in Baku and Trinidad had been that, having penetrated the high-pressure oil sand, after one or more violent eruptions and the ejection of a large quantity of sand, the casing became damaged or the well ceased to produce oil, and was considered to have become exhausted. What had really happened, however, was that the removal of the sand had allowed the capping material, generally a clay, to fall in and dam off the oil from the well. If the flow were restricted from the start much less sand would be removed, and the steady flow would encourage the formation of channels in the sand, draining a large area around the well. Other additions, which made practicable the pumping of water and oil wells in groups, were the air regulator and meter valve, which not only distributed the air in proper quantity to each well, but at the same time indicated the quantity. Also the supplementary, or starting, air nozzle, which obviated maintaining a high and wasteful pressure in the air main to start a well, the liquid level in which rose, when standing, far above the level it maintained when pumping was in progress. An important improvement in the air-lift apparatus especially adapted to the oil wells was a footpiece or air nozzle designed to obtain a thorough mixture of the air with the liquid, without the excessive loss of air by slippage, which was known to occur when the gas was present with the oil.

The Importance of Production

In conclusion, the lecturer said that air compressors were simple and durable machines. The power to drive them might be that available, steam, gas, oil, or electricity. When the conditions in each well had been ascertained, all the wells could be fitted to work at approximately equal air pressures. No other system was really simpler, or more efficient, or required less labour and supervision, only the supervision must be by technically trained oil engineers, because results did not depend merely on the working of the apparatus. The conditions of each individual well must be studied and defects in drilling, casing and application of the apparatus remedied, and suitable modifications made if the best results were to be obtained, and the greatest possible production from each well. The importance of production must be recognised, for the cost of a well was practically the same whether it produced little or much; therefore every additional barrel of oil obtained was a direct gain. The actual cost of raising the oil being only a small proportion of the costs, the main consideration was to have a pumping system which would raise all the oil the well would yield, and keep the well clear and in the best condition for yielding. These conditions were fulfilled by the air-lift system of pumping oil wells.

The following figures, translated from the *Neftiannoie Dielo* (the official technical journal of Baku) of June 5, 1903, show the comparative results from baling and air-lift :—

Depth of Well. ft.	Lift. ft.	Oil per day by baling. poods.	Oil per day by Air-lift. poods.
1,985	853	500	1,500
1,311	1,100	4/500	2,000
1,813	603	800	15/18,000
1,423	560/755	—	1/2,000
1,120	500	—	400
1,155	433	100	400
1,631	625	800	2,000
1,236	615	—	300
1,519	960	2,000	2/3,000
1,101	405	—	700
1,148	245	—	800
1,400	490	2,000	3,000
1,575	755	—	1,500
1,402	455	700	8,000
1,647	390	800	8/15,000
1,729	1,190	—	1,300
2,090	850	—	5,000
2,044	940	—	5,000
1,544	695	800	3/4,000
1,680	630	300	8,000

The Institute of Metals

An invitation from the Mayor and Corporation of Barrow-in-Furness to hold the annual autumn meeting of the Institute of Metals in that town on Wednesday and Thursday, September 15 and 16 next, has been accepted by the Council of the Institute. Particulars of the meeting can be obtained from the secretary, Mr. G. Shaw Scott, 36, Victoria Street, London, S.W. 1, who will also be glad to forward tickets for the tenth annual May lecture, which will be delivered by Professor C. A. F. Benedicks, Stockholm, Sweden, at 8 p.m., on June 10, at the Institution of Mechanical Engineers, Storey's Gate, Westminster, S.W. 1, the subject of the lecture being "The Recent Progress in Thermo-Electricity." Prior to the lecture a ballot for the election of members and students will take place. Persons so elected will be entitled to be present in their capacity as members or students respectively, both at the lecture and at the Barrow meeting, whilst their first annual subscription will cover the extended period ending June 30, 1921. Students of metallurgy, though they may have exceeded the normal age limit of twenty-five, may apply for student membership, provided that their course of studies was interrupted by the war; students so elected may remain in the category of student members up to June 30, 1923, so long as they continue to be students of a recognised school of metallurgy. This concession represents a valuable financial saving. An additional advantage of membership of the Institute of Metals has just been conceded by the council. It has been arranged that members and students of the Institute are henceforth at liberty to attend the meetings of any of the several local sections, which exist throughout the country without further payment beyond their ordinary subscription to the Institute. Members and students receive cards of admission to, and programmes of, the meetings of the various local sections.

The Indian Chemical Service

Professor Thorpe's Review of the Position

PROFESSOR JOCELYN THORPE, President of the Chemical Services Committee of the Indian Industrial Commission, clearly states, in a letter to *Nature*, the position of the chemist and chemical industry in India, and the methods suggested by the Committee for the development of the industry as a result of their recent visit to the country.

The problem presented (he states) was twofold: First, the position of the chemists in India, and secondly, the position of the Indian chemical industry. The position of chemists we found to be exceedingly unsatisfactory. There are in all about 50 chemists in India, and most of them are attached to established Government services, such as forestry, agriculture, medicine, geology, ordnance and education. In the main, the chemists, although working in the services, were not attached to them—that is to say, they were in the position of hirelings without any claim to the advantages attaching to service membership, and without the possession of the *esprit de corps* which characterises such membership. They were, moreover, for the most part working in isolated positions in the different provinces, and were without any means by which they could press their claims on the official lay mind. In consequence, they were in many cases receiving totally inadequate salaries, and were, in fact, often regarded as some kind of freak druggist —a point of view which is even more prevalent in India than in England. It was clear that the only way by which the chemist in India could be brought to occupy a financial and social position which his education and training demanded was to place him on an equality with members of other Government services.

The problem of the chemist was therefore a straightforward one, and was, in our opinion, open to one answer only. The other point, that of the Indian chemical industry, is perhaps rather more complex.

In the first place, there can be no question, I think, that research in chemistry must be divided into pure research and industrial research. It is true that there is no sharp line of division, but in their extreme forms pure research is carried out entirely for the advancement of knowledge, and is without obvious practical bearing, whereas industrial research is done for the advancement and development of industry. The Chemical Services Committee has recommended that pure chemical research should be left to the universities and university institutions, the obvious duty of which is to carry it out. It is not proposed that the chemists attached to university institutions should be normally members of the service, but it is asked that the universities and university colleges should undertake to train men for recruitment into the service in the manner recommended by the Committee.

The Committee's Recommendations

The Committee considers that recruits should have the following training :—

1. An honours degree in chemistry in the first or second class or its equivalent.
2. Training in engineering (machine drawing and workshop practice), where such training has not formed part of the course under (1).
3. One or two years' training in the methods of chemical research under someone competent to train in research.

It is not proposed to institute any system of training within the service, excepting, of course, such practical training as will normally accrue during the working of the service, and it is asked that the universities and university institutions should give the necessary training under 3 above. For this purpose it is recommended that maintenance and equipment grants should be given to promising students to enable them to undergo this training subsequent to graduation.

The Committee considered that, provided the trainer were a man of recognised ability, the question of the subject in which the student should be trained could be safely left to him. It agreed that instruction in the methods of chemical research, received after a course such as that given above, was the best training a man could have to develop any initiative and enthusiasm which he might possess, and that a man so trained ought to be able to turn his hand to anything chemical.

In the case of industrial research it must be remembered that chemistry in one form or another underlies most industries, and that in India the following conditions are present: (*a*) Graet natural resources; (*b*) lack of scientific chemical help to develop these resources; and (*c*) a public very shy to risk capital without some real assurance of the value of the process it is proposed to finance.

Obviously, the best means for advancing chemical industry is for the firms or combination of firms engaged in the industry to establish research laboratories and to work out their own problems by the aid of their own chemists. This is an ideal which the Indian Chemical Service will be formed to foster. It will, for example, help any member of the service who wishes to pass out into the industry, and it will second members of the service for temporary employment to firms who wish to investigate any particular problem. But at the present time there are few manufacturers who employ chemists, and it is evident that some steps are necessary not only to demonstrate to the manufacturer the value of research in connection with his manufacture, but also to demonstrate the possibilities of any particular process to anyone wishing to invest capital and start a new industry.

Who is to do this? There is, we think, only one answer, namely, that, as it is to the interest of the State as well as of the manufacturer to develop industry, it is the duty of the State to convince the manufacturer of the value and necessity of research in connection with his work.

The Indian Chemical Service will have research institutes in the centres of industry of every province. These will be in close touch with the works and with works conditions, and deal with questions of immediate practical importance submitted by manufacturers. They will also carry out research work in connection with the establishment of new industries, and develop a process as far as the unit factory scale. In some cases it will be necessary, in order to demonstrate the value of a process, to erect pioneer factories and work them on the complete commercial scale. Each institute will be under a director of research.

Central Imperial Institute at Dehra Dun

A central Imperial institute will be located at Dehra Dun. It will be under the Director-General of the Chemical Service, and contain laboratories for inorganic and physical chemistry, organic chemistry, analytical chemistry and metallurgical chemistry, each controlled by a deputy-director. Questions involving fundamental research arising out of the work of the provincial institutes will be dealt with here, as well as the initial work in connection with the establishment of new industries. Research work of an All-India character, such as investigations on the utilisation of forest products, will also be done.

It may be added, however, that there will be no official control; the service will be worked by chemists for chemists. Chemists seconded for service with other departments will retain their lien on the Chemical Service, but be under the control of the department to which they have been seconded. The provincial institutes will not be under the control of the central institute, which will act towards them in an advisory capacity only.

In conclusion, I should add that I have discussed the proposed scheme with eminent Indian men of science and prominent business men in different parts of the Empire, and they have told me that they are prepared to give it their wholehearted support. Moreover, Sir P. C. Ray, the distinguished professor of chemistry in the College of Science, Calcutta, who was a member of the Committee and attended all its meetings, while stating at the outset that he was opposed in principle to Government Services generally, nevertheless agreed to each paragraph of the report as it was passed in its final form. He signed the report subject to a separate note in which he expressed his general approval of the scheme in the following words: "In conclusion, I desire to state that, although I consider that the days of Government Services are over, and that the development of industries by the agency of a Government Service is not the most suitable way of dealing with the problem, yet I agree that, if a Government Service is constituted, the proposals of the Committee represent the best method of constituting and carrying on such a service. It is for this reason that I have attached my signature to a report with the major portion of which I am in substantial agreement."

Biochemistry of the Sterols

Introductory Lecture

AT the Physiological Laboratory of London University, South Kensington, on Tuesday, May 18, Dr. J. A. Gardner delivered the first of his course of eight lectures on "The Biochemistry of Sterols."

The best known sterol in the animal organism, the lecturer said, was cholesterol concerning which a very extensive literature had grown during the past 100 years. The modern view of the constitution of cholesterol was that it was an unsaturated secondary alcohol of the polyterpene series—*i.e.*, a substance whose molecule consisted of a number of conjugated hydrogenised aromatic rings. This led to the definition of a sterol as an alcohol of high molecular weight—saturated or unsaturated—of the polyterpene series, no matter whether its carbon content were the same as that of cholesterol or not.

It had been shown that cholesterol was an integral constituent of all the cells of the body, was found in all glands and in all the body plants, secretory or excretory. It might be present as such or in the form of esters.

Cholesterol was not the only sterol in the animal organism. From blood Hürtle had isolated a substance of low melting point and waxlike consistency, which he called Haemosterol. In the deposit fats of the human body similar non-crystalline sterols accompanied cholesterol, and were present in nearly equal quantity. They gave more or less the typical sterol colour reaction, and no doubt belonged to the group. In the fæces of herbivorous animals cholesterol is never found as such or in form of any recognisable derivative. In carnivora cholesterol was excreted as such, but the quantity could be approximately accounted for by that injected with the food. In the human subject the case was different. After early infancy cholesterol was never excreted as such, but always in the form of bihydrocholesterol—partly as coprosterol and partly as the isomeric β cholesterol. In addition to these bihydrocholesterols there were also present amorphous non crystalline low melting substances, which on combustion showed the same composition as cholesterol, and gave the same colour reaction. They were very stable and inert. They could be distilled in superheated steam when they pass over as solid emulsion with water. They might also be fractionally distilled in a vacuum of 1 mm. without a trace of decomposition.

Lately, hydrocarbons of the polyterpene group had been found in the organism, and Mr. Chaston Chapman had recently described a hydrocarbon obtained from fish liver oil, which he named spinacene, which was undoubtedly related to the sterols. It was not unlikely that further investigation would lead to the discovery of such substances in the mammalian organism.

In the vegetable kingdom cholesterol had not been found, but a very large number of substances isomeric with cholesterol—the phylosterols had been described. The literature contained some 30-40 different phylosterols of M.P. 130-140. Further investigation was reducing the number of these, and tending to show that many described were really mixtures of a phylosterol such as the sitosterol of the wheat germ with some more complex member of the series. Glucorides consisting of phylosterols and glucose had also been isolated by Power and his co-workers. Apparently the phylosterols of various kinds were just as widely and universally distributed in plant tissue as cholesterine in the animal organism. Though the literature dealing with the sterols, both chemical and physiological is extensive, yet in the text books on physiology these substances were dismissed in a few short paragraphs. Hitherto protoplasm and the products of metabolism had been looked upon as constituted of proteins, carbohydrates and fats, and little or no attention paid to other things. Now we must include another and quite different group of substances—the sterols or polyterpene alcohols.

What was the exact function of these substances had not yet been fully ascertained, but this would be demonstrated in a later lecture. The lecture ended with a description of the physical properties of cholesterol and its chief esters.

The next lecture will deal with the chemical constitution of cholesterol, as the typical and best known sterol.

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*We are glad to learn that PROFESSOR HINCHLEY, chairman of the Chemical Engineering Group, has benefited considerably by his voyage and hopes soon to be able to return to his work.

Lever Brothers, Ltd.

New Capital Proposals

THE directors of Lever Brothers, Ltd., recommend that the capital of the company be re-arranged, and that it be increased to £130,000,000 by the creation of 10,000,000 new 7 per cent. cumulative preference shares of £1 each, and 20,000,000 new 8 per cent. cumulative A preference shares of £1 each

It is proposed to consolidate the existing classes of First, A, B and C Preference shares, the First Preference shares of £10 each being subdivided into ten fully-paid shares of £1 each. These combined Preference shares issues, together with a new creation of £10,000,000 shares, will constitute a new class of £40,000,000 first preference capital to be called Seven per Cent. Cumulative Preference shares of £1 each. As a result of this consolidation the rate of annual dividend on the existing First, A and B Preference shares will be increased from 5 per cent., 6 per cent. and 6½ per cent. respectively to 7 per cent. In the case of the Seven per Cent. C Preference shares the rate of dividend will be unaltered and holders will be allotted by way of bonus one additional new fully-paid Seven per Cent. Preference share in respect of every 15 C Preference shares now held, the dividend yield on the present holding of these shares being thus increased to approximately 7½ per cent.

The existing classes of Fifteen per cent. Preferred Ordinary and Fifteen per Cent. A Preferred Ordinary shares are also to be consolidated and, added to a fresh creation of £20,000,000 share capital, are to constitute a new class of £40,000,000 2nd Preference capital to be called Eight per Cent. Cumulative A Preference shares of £1 each. While the rate of dividend is thus reduced from 15 per cent. to 8 per cent., it is proposed to double the capital holding of the 1st Preferred Ordinary shareholders by the allotment by way of bonus of new fully-paid Eight per Cent. A Preference shares, and, in the case of the A Preferred shares, to allot by way of bonus seven additional new fully-paid Eight per Cent. A Preference shares in respect of every eight A Preferred Ordinary shares now held. The total amount of dividend in the case of the two existing classes of Preferred Ordinary shareholders is thus fully maintained, but their share capital holding will be substantially increased.

Capitalisation of Reserves

These proposals will necessitate the capitalisation of undivided profits (including sums standing to the credit of reserves) to the amount of £3,944,411, and will increase by £217,963 the dividends annually payable to holders of the existing Preference and Fifteen per Cent. Preferred Ordinary shares. The amount of capitalised profits appropriated to the holders of the C Preference shares is £533,333, to the Fifteen per Cent. Preferred Ordinary shares £2,313,014, and to the A Preferred Ordinary shares £1,098,065. By the issue of this new capital the company's issued capital is increased from £29,916,943 to £33,861,355.

The board announce that the holders of the ordinary shares have waived their rights to the present capital distribution, and will not participate therein. They have already given their consent to the proposed distribution, and the consequent increase in the amount of preferential dividends payable as being in the best interests of the company, and the directors accordingly commend the scheme for acceptance.

New Site for London University

IN a letter to Lord Rosebery, the Chancellor of the University of London, Mr. H. A. L. Fisher has made an offer, on behalf of the Government, to present to the University a large site which it is now in a position to acquire behind the British Museum. It is suggested that the site should be used for a new headquarters of the University and for colleges and institutions connected with it. The Senate of the University has referred the matter to a committee for early report.

Methylated Spirits as a Beverage

AT Liverpool on Wednesday, JOHN BAIN, chemist, was ordered to pay a fine of £50 and £15 costs for selling methylated spirits for use as a beverage, and W. S. Atkinson, his assistant, was fined £10 on each of two informations for preparing the spirits and selling them.

Chorzow Calcium Cyanamide Factory

The Caro Process

In March, 1915, the German Government drew up two contracts with the Bayerische Stickstoffwerke Aktien Gesellschaft in Trostberg, Bavaria, on the same lines as similar contracts drawn up for the erection of other factories utilised for the production of war material, such as the shell factory Deutsche Werke A.G. of Spandau. These contracts, the *Board of Trade Journal* states, provided for the construction of two factories to be worked by the B.S.A.G., one with a power station of 100,000 kw. at Piesteritz-Wittemberg, near Berlin, and the other with a power station of 30,000 kw. at Chorzow, near Beuthen, to develop the process discovered by Gheimrat Caro of producing calcium cyanamide with nitrogen obtained from the air. The contracts drawn up in March, 1915, laid down that the German Government paid all the expenses of the B.S.A.G., and the B.S.A.G. guaranteed the working of the factory on behalf of the State in consideration of a compensation for every kilogramme of nitrogen produced. In addition, the B.S.A.G. had the right to purchase these factories from the Government under certain conditions and, *vice-versa*, especially if the working was not sufficiently remunerative during a period of two consecutive years.

The Chorzow factory started working 7½ months after this agreement had been drawn up, and the work of construction continued till 1917. The B.S.A.G. exercised its right of purchase of this factory in 1919, and combined with the Petroleum Aktien Gesellschaft in Berlin for the purpose of purchasing this right. A limited liability company was formed under the name of Stickstoff Treu hand Gesellschaft m.b.H. The capital was one million marks, half of which was found by the Bayerische Stickstoff Werke and the other half by the Petroleum Aktien Gesellschaft. The Stickstoff Treuhand Gesellschaft m.b.H. having paid for the right of purchase of the factory, formed another company for the purpose of purchasing the factory from the State. This new company was called the Oberschlesische Stickstoffwerke Aktiengesellschaft. The original capital of 250,000 marks was immediately raised to 110,000,000 marks.

The factory covers an area of about 135 acres and employs 2,200 workmen of German and Russian nationality. No Poles are employed, as it is said they do not like the nature of the work. The present wages, which are in force till the end of March, range from 2·60 marks to 3·50 marks an hour. No difficulty appears to be experienced in procuring the necessary labour. The factory has a central power station of 20,000 kw., and is constructing another of 10,000 kw., the latter being reserve power. Further, 30,000 kw. are supplied by the Schlesische Elektrizitaets und Gaswerke. The current is an alternating current.

Methods of Production

There are two distinct processes in the production of calcium cyanamide ($CaCN_2$) :—

(*a*) The manufacture of CaC_2 (calcium carbide).

(*b*) The conversion of CaC_2 into $CaCN_2$ (calcium cyanamide)

Process (*b*) is that discovered by Caro.

Calcium cyanamide is produced in electric furnaces, of which there are 7, two of them being in reserve. The negative electrode is an earth. The positive electrode consists of six blocks of graphite, size 1·50 metres by 0·50 metre by 0·50 metre. The electrodes are manufactured by Siemens Schuckert, Berlin, or by Plana in Ratiber. The current used is 8,500 amperes, and the voltage ranges from 70-170 volts. Temperature attained in the furnaces is 2,500 deg. This conversion is brought about by passing a current of nitrogen still containing 0.3 per cent. oxygen over CaC2, heated to a temperature of 1,500 deg., for a period of about twelve hours. At least 50 per cent. of the nitrogen employed is lost in this process. The commercial calcium cyanamide contains about 20 per cent. nitrogen (theoretically 2·45 per cent.).

The Linde process is used in the extraction of nitrogen from the air. The air is first liquefied and the oxygen is separated from the nitrogen, the boiling point of the former being lower than that of the latter.

One ton of chalk is used for approximately every 950 kilogrammes of calcium carbide produced. One ton of calcium carbide (CaC_2) is used for approximately every 1,250 kilogrammes of calcium cyanamide ($CaCN_2$) produced. The consumption of coal is about twice to three times the production of calcium cyanamide. The yearly production of $CaCN_2$ is approximately 125,000 tons. At the end of February the price was 4·50 mk. per kilogramme of calcium cyanamide, but the Government have now raised the prices of artificial manures, and the price at the end of March was 10·70 mk. the kilogramme. A further rise from 10·70 mk. to 15 mk. per kilogramme is contemplated.

Production of Ammonium Nitrate

The factory is equipped with the necessary plant for the conversion of calcium cyanamide into ammonium nitrate. The total production of $CaCN_2$ can thus be converted if necessary. The $CaCN_2$ is treated with superheated steam under considerable pressure and split up into ammonia and chalk. The ammonia is then converted into ammonium nitrate. The possible yearly production of ammonium is 50,000 tons, and of ammonium nitrate 36,000 tons.

British Dyestuffs Corporation, Ltd.

First Annual Report

The report for the year ended October, 1919, states that after deducting £118,803. 13s. 6d. for dividends already paid on the preference shares at the rate of 7 per cent. per annum (less tax), and allowing £59,977. 1s. 2d. for the payment of a dividend on the preference ordinary shares, recommended by the directors, at the rate of 8 per cent. per annum (less tax), calculated from the due date of each instalment, £58,826. 12s. 4d. remains to be carried forward.

The trading results of the Associated Companies for the period have been adversely affected by the change-over from war to peace conditions. The Armistice was declared at the beginning of the company's financial year, and the re-organisation of the works to meet the altered conditions was immediately taken in hand. Some time necessarily elapsed before this re-organisation could be completed, and the plant and employees previously engaged on special war work diverted to the manufacture of dyestuffs. An issue of £5,000,000 preference and preferred ordinary share capital was made in July, 1919. No advantages from any new construction, for which the proceeds of this issue will be available, have been obtained during the year under review, but the money will enable the Associated Companies to carry out important extensions and developments at their works, which will substantially increase the volume and range of dyestuffs in future years. In common with other industries, great difficulty and delay have been experienced in obtaining delivery of new plant and equipment essential for increased production. In spite of this, continuous and substantial progress has been made. By October 31, 1919, the volume of output was approximately two-thirds of the total weight of dyestuffs consumed in the United Kingdom during 1913. The recent general expansion of trade has led to an unprecedented demand upon this country for dyestuffs, both in quantity and variety, which must be met by correspondingly increased efforts in the direction of production and research. The directors have recognised the paramount importance of having a department where research work can be carried out along the most modern and scientific lines, and of affording encouragement to those engaged on the scientific and research side of the industry. Large sums of money have been allocated for these purposes, and satisfactory progress has been made during the year. Some of the universities are giving attention to this problem and are affording valuable assistance to the undertaking. Lord Moulton has been compelled by the pressure of his high judicial duties to resign his position as chairman of the Corporation and Government director. The directors express their grateful recognition of the eminent services Lord Moulton has rendered, not only to the Corporation but to the dye users of this country. Sir Henry Birchenough has been elected chairman of the board in succession to his lordship. Mr. W. H. Aykroyd was appointed a director of the Corporation in July, 1919, and Lord Ashfield in February, 1920, and, in accordance with the articles of association, now retire. Sir Harry D. McGowan also retires in rotation. These gentlemen are eligible and offer themselves for re-election. The retiring Auditors, Messrs. Thomson, McLintock & Co., offer themselves for re-election.

Chemical Matters in Parliament

Anglo-Persian Oil (Australia)

MR. SWAN asked the President of the Board of Trade (House of Commons, May 12) whether the agreement made between the Australian Commonwealth and the Anglo-Persian Oil Co. involves an undertaking by the Commonwealth Government to protect the company by fiscal measures against competition; and whether he can state the exact terms of the agreement?

Mr. Kellaway: Cable messages which have appeared in the Press indicate that this agreement contains certain fiscal provisions to protect the new refinery company in which the Commonwealth Government is to hold a majority of shares. I understand that a Bill giving effect to the agreement has been introduced into the Commonwealth Parliament, but the text of the Bill has not yet been received in this country, and the exact terms are therefore not available.

Carbonate of Potash

Mr. Sitch asked the President of the Board of Trade (House of Commons, May 17) if his attention had been drawn to the conditions prevailing in the glass-making industry of the Midlands through the serious shortage of supplies of carbonate of potash imported from abroad and on which the industry almost entirely depended prior to the war; whether he was aware that manufacturers of the finer qualities of glassware were unable to secure satisfactory results from the use of such material as was obtainable from makers in this country; whether he realised that, owing to this scarcity, British glassmakers were finding it increasingly difficult to recover their pre-war eminence in both home and international markets, where foreign manufacturers were rapidly occupying that position through being able to secure larger supplies of essential carbonate of potash from Germany as compared with British manufacturers; and could he see his way to order a speedy inquiry into the matter with the view of preventing damage and loss to this key industry?

Sir R. Horne: I am aware of the position in respect of the supplies of carbonate of potash for the glassmaking industry, and in my opinion no inquiry at this moment would add to our information. As regards supplies from Germany, I would point out that there are no restrictions on the importation from that country, and that British manufacturers are at no disadvantage as compared with foreign manufacturers in this respect.

Mr. Sitch asked the approximate quantities of carbonate of potash exported from Germany to Belgium, France, the United States of America and Great Britain since the date of the Armistice; the approximate quantity of natural deposits of potash in Germany from which the carbonates were derived, and also the extent to which the process of this conversion had increased during the past 18 months in that country?

Sir R. Horne: I regret that I have no official statistics which show the exports of carbonate of potash from Germany to Belgium, France or the United States. The quantity imported from Germany into the United Kingdom since November 11, 1918, amounts to 20½ tons. I am not aware of any approximate estimate of the extent of the natural deposits of potash in Germany, but they are unquestionably very great, running into many millions of tons. I have no definite information as to the extent of the production of carbonate of potash since the Armistice, but I understand that it has been very much less than the normal production.

Mr. Sitch asked whether preferential treatment had been accorded any of Great Britain's Allies on the continents of Europe or America, as against the United Kingdom itself, in regard to supplies, large or small, of carbonate of potash any of them shall be allowed to procure from Germany under peace treaty, indemnity or fiscal arrangement; and, if not, could he say whether Germany was permitted without restriction to conclude contracts with any of the Allied Governments for supplying this essential article of glass manufacture to any extent it chose, even to the deprivation of supplies to the United Kingdom either partially or altogether?

Sir R. Horne: I am not aware that Germany has discriminated in this matter against the United Kingdom. By Article 267 of the Treaty of Peace, Germany is required to extend to all the Allied and Associated States every favour, immunity, or privilege in regard to exportation which she may grant to any foreign country.

Power Alcohol

In reply to questions by Lord Curzon (House of Commons, May 17), Sir Robert Horne stated: H.M. Government are anxious to do what they can to encourage the use of alternative fuels for internal combustion engines, and progress is being made in connection with the inquiry by the Fuel Research Board into the production of power alcohol in the British Empire. There is, I believe, no question that alcohol in suitable mixture is a satisfactory fuel for internal combustion engines. The Finance Bill now before the House contains a clause providing for the payment of the same allowance in respect of spirits used for making power methylated spirits, as is now made in respect of spirits used for making industrial methylated spirits; the clause also gives power to the Commissioners of Customs and Excise to prescribe the denaturants to be used in the case of power methylated spirits.

Oil Deposits: Ownership and Royalties

In reply to questions by Lieut.-Commander Kenworthy (House of Commons, May 13), Mr. Bonar Law stated that (1) A decision had been reached by the Government regarding the ownership of and royalties on oil deposits in Great Britain; (2) he did not propose to permit fresh vested interests to be created in favour of landowners below whose land oil might be discovered; (3) a Bill dealing with this subject had been drafted and was receiving the consideration of the Government.

Prices of Ground Basic Slag

THE Ministry of Agriculture and Fisheries and the Board of Agriculture for Scotland have come to an agreement with the makers of ground basic slag with regard to the maximum prices to be charged for this fertiliser in the season 1920-21. These prices are the maximum net cash prices for ground basic slag in maker's 2 cwt. bags, delivered in railway truck, or ree ex barge or ship at purchaser's or consumer's railway station or wharf in Great Britain, or, in the case of shipments to Ireland, the Channel Islands or the Isle of Man, carriage paid to station at port of shipment in Great Britain; they are as follows:—

Percentage (calculated in terms of tri-basic phosphate of lime) of total phosphates.	Price per ton.
12 per cent. and over, but less than 14 per cent.	82/0
14 " " " " " " " 16 " "	89/0
16 " " " " " " " 18 " "	96/0
18 " " " " " " " 20 " "	103/0
20 " " " " " " " 22 " "	110/0
22 " " " " " " " 24 " "	112/0
24 " " " " " " " 26 " "	115/0
26 " " " " " " " 28 " "	118/0
28 " " " " " " " 30 " "	121/0
30 " " " " " " " 32 " "	124/0
32 " " " " " " " 34 " "	127/0
34 " " " " " " " 36 " "	131/0
36 " " " " " " " 38 " "	135/0
38 " " " " " " " 40 " "	139/0
40 " " " " " " " 42 " "	143/0
42 " " " " " " " 44 " "	147/0

The above prices apply to England, Scotland and Wales, but not to Ireland, and are maximum prices for sales of ground basic slag for delivery between September 1, 1920, and March 31, 1921. In the case of sales of ground basic slag for delivery during June, July and August, 1920, the maximum prices for all qualities will be less than the prices set out above, in accordance with the following table, namely:—

Period for delivery.	Reduction in the maximum prices set out above.
During June, 1920	4s. per ton
During July, 1920	3s. per ton
During August, 1920	2s. per ton

The other conditions of sale remain substantially the same as in the 1919-20 season, with the exception of slight variations in the amounts of the various allowances or additional charges authorised by the notice F.P. 493/S.I. for the 1919-20 season. Full particulars will be given in a notice which will shortly be issued and which will be obtainable post free on application to the Director-General, Land and Supplies Department, Ministry of Agriculture and Fisheries, 72, Victoria Street, London, S.W.1.

From Week to Week

Mr. W. WATERS, chemical manufacturer, died suddenly at Brediland Chemical Works, on Monday, May 17.

DR. E. K. MUSPRATT, of Liverpool, has given £5,000 in support of the University appeal.

The election of a PROFESSOR OF PHYSICAL CHEMISTRY for Cambridge University will take place on July 8.

Mr. F. E. SMITH, F.R.S., of the National Physical Laboratory, has been appointed director of scientific research to the Admiralty.

An order issued by the Board of Trade brings milk (fresh, dried, condensed) and margarine within the scope of the PROFITEERING ACTS.

The death took place on Wednesday, May 12, in his 78th year of Mr. JOHN GREEN, of Richmond, who was for over 50 years with the London Zinc Mills, Ltd.

Plans submitted by MESSRS. JAMES D. HARDIE for alteration and additions to their chemical works at Port Dundas Road, Glasgow, has been passed by the Glasgow Dean of Guild Court.

W. J. BUSH & CO., manufacturing chemists, London, have given a further subscription of 250 guineas towards the extension of the organic chemical laboratory at Oxford University.

SIR WILLIAM PEARCE, M.P., director of Spencer, Chapman & Messel, Ltd., chemical manufacturers, and Mr. C. V. SALE, chairman of the British Metal Corporation, have been appointed additional members to the Advisory Committee of the Department of Overseas Trade.

Sir John Cadman (director of H.M. Petroleum Department), Mr. J. C. Clarke (deputy-director, H.M. Petroleum Department), and Dr. W. R. Ormandy are among the members of the new EMPIRE MOTOR FUELS COMMITTEE appointed by the Imperial Motor Transport Council.

A resolution has been unanimously passed by the employees of the BRITISH DRUG HOUSES, LTD., thanking the directors for their consideration in again distributing a bonus of 6 per cent., and expressing gratification at the unbroken cordial relationship existing between the directorate and staff.

PROFESSOR F. C. PHILLIPS, who died in February last, was for 40 years instructor in chemistry in the University of Pittsburgh, U.S.A. Dr. Phillips had a wide reputation as an authority on natural gas, and was closely identified with the establishment of the Priestley Memorial Fund.

The NATIONAL FEDERATION OF IRON & STEEL MANUFACTURERS announce that the production of pig iron in April amounted to 671,000 tons, of which 246,000 tons were hematite, 226,000 tons basic, and the remainder forge, foundry and other qualities. The production of steel ingots and castings amounted to 793,000 tons.

The Council of Sheffield University have appointed Mr. F. G. TRYHORN, M.Sc., to be lecturer on physical chemistry, and Mr. JOSEPH CONNOLLY to be honorary lecturer and works visitor for the Glass Department. The Sorby Fellowship has been awarded by the Royal Society Sorby Research Fund Administrative Committee to Dr. F. C. THOMPSON, at present lecturer in metallurgy in the university.

The April number (Vol. XXXII., Part III.) of the *Proceedings* of the Physical Society of London contains a paper on "The Influence of Small Changes of Temperature on Atmospheric Refraction," by Sir Arthur Schuster. Mr. T. Smith, of the National Physical Laboratory, contributes a paper entitled "On Balancing Errors of Different Orders," and Mr. F. S. Newman one on the "Absorption of Gases in the Electric Discharge Tube."

The death is reported of MR. JAMES GAYLEY, who received the Perkin Medal of the American Section of the Society of Chemical Industry in 1913 in recognition of his valuable work in chemical metallurgy, including the invention of furnace improvements, bronze cooling plates and the dry-air blast. Mr. Gayley was president of the American Institute of Mining and Metallurgy in 1904-6, and was the first vice-president of the United States Steel Corporation.

H.M. Consul at Antofagasta, Chile, states that several of the nitrate factories are beginning to produce NITRATE OF POTASH regularly. During the last two years the total production was only about 1,100 tons. Production is now to be increased, and sales have been made for delivery up to June, 1920, of 13,500 tons. The nitrate of potash is produced by further refining the 95 per cent. nitrate customarily produced up to 99 per cent., and is not a by-product. At present a premium of from £1 to £1. 10s. per ton is secured on the price ruling for ordinary 95 per cent. nitrate, and so far all sales have been made to the United States of America.

A meeting of over 2,000 members of the SOCIETY OF PHARMACISTS in Shoreditch Town Hall, on Tuesday, passed a resolution of protest against the refusal of the Industrial Council to grant an advance of 10s. per week for adults and 5s. for those under 21. The meeting, however, decided to observe the agreement signed in December last with the Drug & Fine Chemical Manufacturers' Association, which can be terminated after six months' notice on either side. Mr. F. Hawkins, organising secretary of the Society, stated that the present wage of a skilled worker in the trade was only £3. 5s. a week, and unless an increase were granted in the near future, notice of termination of the agreement would be given.

The National Federation of Glass Bottle Workers and the Manufacturers' Association of Great Britain and Ireland have concluded an IMPORTANT WAGES AGREEMENT. In consequence of the increased cost of living, the men asked for an advance of 25 per cent. on their aggregate earnings, and the employers replied with an offer of 15 per cent. This has been accepted by the men, whose earnings are 152·70 per cent. above those of 1910. The two largest glass bottle workers' unions in the country, the Yorkshire Glass Bottle Makers' United Trade Protection Society and the National Flint Glass Bottle Makers of Great Britain and Ireland have agreed to amalgamate, and the new society will have a total membership of over 5,000.

Speaking before the SOCIETY OF GLASS TECHNOLOGY, at the Institute of Chemistry on Wednesday, Mr. C. J. Peddle stated that when the war began our manufacturers had to begin afresh, and during the past three or four years the industry had discovered more than it had taken Germany some 30 years to discover. We had produced more than 70 types of optical glass; we were actually manufacturing these types on a large scale, and we had already developed many more types which would soon be in the process of manufacture. Not only was this country no longer dependent upon foreign sources, but it was in a position to supply the world, the quality of all the glass being at least equal to and in some cases better than that ever supplied by Germany.

Following upon the recent acquirement of a controlling interest in the PEARSON & KNOWLES COAL & IRON CO., LTD., and their allied firms, by Sir W. G. Armstrong, Whitworth & Co., Ltd., several changes have taken place in the boards, which are now constituted as follows: The Pearson & Knowles Co., Sir Glynn H. West (chairman), W. Peter Rylands (vice-chairman), John Bleekly, jun., Frank W. Cooper, H. Harmood Banner, Henry Harrison, Gordon H. Fraser (managing director). Rylands Brothers, Ltd., Sir Glynn H. West (chairman), Frank W. Cooper, Gordon H. Fraser, Henry Harrison, W. Peter Rylands (managing director). The Partington Co.: Sir Glynn H. West (chairman), W. Peter Rylands (vice-chairman), Gordon H. Fraser, Henry Harrison, Frank W. Cooper (managing director).

The dispute in the DRUG AND FINE CHEMICAL TRADE spread on Monday to Liverpool, where a large number of men ceased work in sympathy with the 2,000 chemical workers on strike in London. Over 1,800 notices to withhold labour expired in Liverpool on Saturday, May 15, and the chemical industry is stated to have been brought to a standstill in that city by practically the whole of this number refusing to resume work on Monday. It was reported at the headquarters of the Warehouse and General Workers' Union on Monday that notices to cease work in a week's time had been issued among the chemical workers in Manchester, and that there were prospects of the strike spreading to Birmingham, Leeds and Newcastle. The Executive Committee of the Drug and Fine Chemical Manufacturers' Association on Monday considered an application from the unions that whatever advances are agreed upon in June should date back to April in view of the increased cost of living. It was decided in reply to call attention to the agreement made on the initiative of the unions for avoiding strikes and lock-outs, and to state that, until the strikers return to work, and evidence is given that union representatives can pledge their members to abide by agreements made, negotiations cannot serve any effective purpose.

References to Current Literature

Only articles of general as distinct from specialised interest are included and given in alphabetical order under each geographical subdivision. By publishing this digest within two or three days of publication or receipt we hope to save our readers time and trouble; in return we invite their suggestions and criticisms. The original journals may be consulted at the Patent Office or Chemical Society's libraries. A list of journals and standard abbreviations used appeared in our issue of December 27 last.

British

ANALYSIS. A new method for the estimation of methyl alcohol. S. Schryver and C. C. Wood. *Analyst*, May, 164-170. Methods for estimating methyl alcohol in water, acetone, and ethyl alcohol are described.

The systematic detection of acetates. L. J. Curtinan, D. A. Broggi and V. Fournan. *Chem. News*, May 14, 230-231.

Detection of coal tar dyes in butter and margarine. G. van B. Gilmour. *Analyst*, May, 173.

ELECTROLYSIS. The application of electricity in the dyeing industry. F. M. Perkins. *J. Soc. Dyers & Col.*, May, 138-145. The author deals principally with the electrolytic production of intermediates and dyes.

HYDROGENATION. Catalytic action at solid surfaces. Some factors controlling the rate of hydrogenation of ethylenic compounds in presence of nickel. E. F. Armstrong and T. P. Hilditch. *J. Soc. Chem. Ind.*, May 15, 120-124T. The results of a number of experiments are given and discussed.

MINERALS. The mineral production of the Empire. F. Merricks. *Bull. Inst. Min. Met.*, May. 27 pp. and six sheets of tables. Presidential address delivered to the Institution on May 20.

POWER. Power from low grade gas. W. A. Tookey. *Gas World*, May 15, 415.

RUBBER. The acceleration of vulcanisation. D. F. Twiss and S. A. Brazier. *J. Soc. Chem. Ind.*, May 15, 125-132 T. The results of many experiments are shown in graphs.

French

AMINES. The preparation of amines by catalysis. A. Mailhe. *Comptes rend.*, May 10, 1120-1123.

ANALYSIS. The separation of tin and antimony. Determination of tin by cupferron. A. Kling and A. Lassieur. *Comptes rend.*, May 10, 1112-1114.

Analysis of industrial chlorobenzenes by a modified enrichment method. F. Bourion and C. Courtois. *Comptes rend.*, May 10, 1115-1117.

MINERAL OILS. Some definitions of petroliferous products and other hydrocarbons. F. Bordas. *Ann. Falsif.*, March-April, 89-93. A discussion of the nomenclature of coal and petroleum oils.

United States

ALCOHOL. Vapour composition of alcohol-water mixtures. W. K. Lewis. *J. Ind. Eng. Chem.*, May 1, 496-499.

ALLOYS. The electrical production of alloys. R. M. Major. Amer. Electrochem. Soc., April 10. (Advance copy.) 7 pp. An account of the production of a number of alloys in the electric furnace.

ANALYSIS. The problem of determining graphitic carbon. W. A. Selvig and W. C. Ratliff. Amer. Electrochem. Soc., April 10. (Advance copy.) 30 pp.

Substitutes for platinum wire in bead and flame tests. C. C. Kiplinger. *J. Ind. Eng., Chem.*, May 1, 500.

A convenient method for the determination of water in petroleum and other organic emulsions. E. W. Dean and D. D. Stark. *J. Ind. Eng. Chem.*, May 1, 486-490.

The detection of arsenic in sulphur. H. S. Davis and M. D. Davis. *J. Ind. Eng. Chem.*, May 1, 479-480.

Butyl alcohol as the medium for the determination of saponification numbers. A. M. Pardee, R. L. Hasche and E. E. Reid. *J. Ind. Eng. Chem.*, May 1, 481-482.

A new method for the determination of sulphur in oils. C. E. Walters. *J. Ind. Eng. Chem.*, May 1, 482-484.

Determination of minute quantities of oil in sulphur. L. S. Bushnell and H. S. Clark. *J. Ind. Eng. Chem.*, May 1, 485.

Practical methods for the determination of radium: III. Alpha-ray method, gamma-ray method; Miscellaneous. S. C. Lind. *J. Ind. Eng. Chem.*, May 1, 469-472.

ASSAYING. Volatilisation in assaying. F. P. Dewey. *Chem. & Met. Eng.*, April 28, 797-802. A review of the literature, and a record of some tests on assaying losses.

CATALYSTS. A new type of catalyzer for hydrogenation. W. D. Richardson. *Chem. & Met. Eng.*, April 28, 793-796. The preparation of finely divided nickel by mechanical grinding is described.

CHARCOAL. Charcoal before the war. II. W. D. Bancroft. *J. Phys. Chem.*, March, 201-224. Conclusion of paper already noted (CHEMICAL AGE, 1920, 359).

COLLOIDS. Some practical applications of colloid chemistry. J. Alexander. *J. Ind. Eng. Chem.*, May 1, 434-436.

Ceramic processes associated with colloid phenomena. A. V. Bleininger. *J. Ind. Eng. Chem.*, May 1, 436-438.

ELECTRIC FURNACE. The electric furnace as applied to metallurgy. C. J. West. Amer. Electrochem. Soc., April 10. (Advance copy.) 92 pp. A valuable bibliography covering the years 1900-1919.

The position of the electric furnace in iron and steel metallurgy. L. B. Lindemuth. Amer. Electrochem. Soc., April 10. (Advance copy.) 17 pp.

EXTRACTION. Numerical relations between cells and treatments in extraction processes. L. F. Hawley. *J. Ind. Eng. Chem.*, May 1, 493-496. The efficiency of various extraction processes is considered.

The electric-arc melting furnace and the central station electric company. A. C. Smith. Amer. Electrochem. Soc., April 10. (Advance copy.) 9 pp. A discussion of the effect of the arc melting furnace on the power supply.

FATTY ACIDS. Heat balance of a distillation plant for the recovery of fatty acids from cottonseed foots. J. Alsberg. *J. Ind. Eng. Chem.*, May 1, 490-492.

FERRICYANIDE. The electrolytic preparation of potassium ferricyanide. O. W. Brown, C. O. Henke and I. L. Miller. *J. Phys. Chem.*, March, 230-237.

FERROSILICON. Properties of ferrosilicon. F. A. Raven. Amer. Electrochem. Soc., April 10. Advance copy.) 12 pp.

GRAPHITIC ACID. Graphitic acid. G. A. Hulett and O. A. Nelson. Amer. Electrochem. Soc., April 10. (Advance copy.). 15 pp. The paper deals with composition of acid.

NITROGEN. The consumption of inorganic nitrogen in the United States. D. P. Gaillard. *Chem. & Met. Eng.*, April 28, 783-786. The consumption in agriculture and in industries is analysed.

PHOSPHATES. The solubility of mono and diammonium phosphate. G. H. Buchanan and G. B. Winner. *J. Ind. Eng. Chem.*, May 1, 448-451.

RARE EARTHS. The concentration of radium and mesothorium by fractional crystallisation. J. L. Nierman. *J. Phys. Chem.*, March, 192-200.

SEDIMENTATION. "Settling" problems. W. A. Deane. Amer. Electrochem. Soc., April 10. (Advance copy.) 30 pp. A discussion of various methods of clarification and "thickening."

STEEL. The manufacture of high-speed steel in the electric furnace. R. C. McKenna. Amer. Electrochem. Soc., April 10. (Advance copy.) 7 pp. The advantages of the electric furnace for making high-speed tool steel are emphasised.

SUPERHEATERS. Superheaters and the utilisation of superheated steam. D. D. Pendleton and C. A. Brandt. *Proc. Eng. Soc., W. Penna*, February, 25-79.

WOOD. The distribution of certain chemical constants of wood over its proximate constituents. W. H. Dore. *J. Ind. Eng. Chem.*, May 1, 472-476.

The proximate analysis of coniferous woods. W. H. Dore. *J. Ind. Eng. Chem.*, May 1, 476-479.

Miscellaneous

OILS. The rancidity of Philippine coconut oil. G. A. Perkins. *Philippine J. Sci.*, Vol. XV., No. 5, 463-474. The causes of rancidity have been investigated.

Patent Literature

We publish each week a list of selected complete specifications accepted as and when they are actually printed and on sale. In addition, we give abstracts within a week of the specifications being obtainable. Readers can thus decide what specifications are of sufficient interest to warrant purchase, the only way of obtaining complete information. A list of International Convention specifications open to inspection before acceptance is added, and abstracts are given as soon as possible.

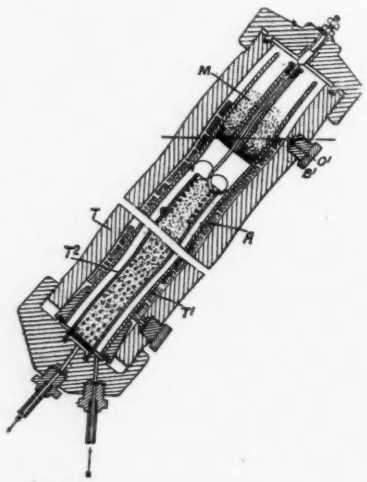
International Specifications Not yet Accepted

140,060-1. SYNTHETIC AMMONIA. L. Duparc, Ecole de Chimie, Geneva, and C. Urfer, 8, Rue de Chantepoulet, Geneva. International Convention date, March 13, 1919.

140,060. A mixture of nitrogen and hydrogen at a temperature of 250°-600°C. and at atmospheric pressure, is passed over a catalyst metal such as lithium, uranium, calcium, barium, strontium, the rare metals of the fourth group of the periodic system such as cerium, thorium, zirconium, titanium, and didymium, lanthanum, glucinium, and vanadium; or alternatively the nitrides of these metals. The catalytic material should be such that when heated in nitrogen it forms a nitride which is decomposed by hydrogen. A mixture of one or more of the above may be used, together with an inert carrier, such as alumina or magnesia. The preferred mixture consists of cerium, lanthanum, thorium, and alumina or magnesia. The nitrogen and hydrogen are mixed in the correct proportions and passed over heated copper, nickel, or palladium to eliminate oxygen, and then through a sulphuric acid washer, and a tower containing quick lime and calcium chloride. The purified and dried gas is then passed over the catalyst in a series of tubes which are heated by electric resistance coils or by baths of molten metal. The length of catalyst in each tube is made short so as to avoid decomposition of the ammonia.

140,061. This relates to the preparation of the catalysts mentioned above. The oxide of a metal such as those specified above is reduced by means of aluminium or magnesium, and the catalytic metal is thus obtained in a finely divided form distributed over the oxide of the reducing metal. As an example, finely powdered quicklime is intimately mixed with powdered aluminium or magnesium, and the reaction is started by introducing a piece of ignited magnesium ribbon. An excess of the reducing metal may be used. The catalyst may be regenerated by adding more of the catalytic metal oxide and reducing metal, and repeating the process. When the mass is cooled in air or in nitrogen, the catalytic metal is partly converted into nitride and an increased activity is obtained.

140,083. HIGH PRESSURE AND TEMPERATURE REACTIONS; SYNTHETIC AMMONIA. L'Air Liquide, Soc. Anon. pour l'Etude et l'Exploitation des Procedes G. Claude, 48, Rue St. Lazare, Paris. International Convention date, December 18, 1918.

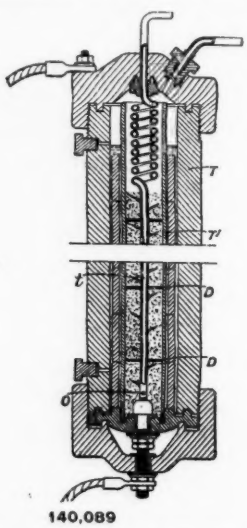


140,083

Apparatus for use in high temperature and pressure reactions, such as the synthesis of ammonia, is provided with an external pressure resisting wall which is protected by an internal annular layer of inert, heat-insulating material, such as fused potash-soda mixture. The object is to prevent movement of the fused mixture, and consequent decrease in its efficiency. The fused mixture is contained between the outer wall T, and the tube T′ surrounding the reaction tube T², and its movement is prevented by a pile of rings A of magnetic iron oxide or other material, which is a heat-insulator. The rings may be in two or more layers to prevent radial movement of the liquid. Any hydrogen dissolved by the liquid reacts with the iron oxide to form water vapour, and this is prevented from mixing with the reacting gases by a layer M of reduced iron which decomposes it. The height of the protecting liquid is determined by an overflow opening O′ which may be closed by a plug B′.

140,089. EXOTHERMIC REACTIONS IN GASES; SYNTHETIC AMMONIA. L'Air Liquide, Soc. Anon. pour l'Etude et l'Exploitation des Procedes G. Claude, 48, Rue St. Lazare, Paris. International Convention date, December 24, 1918.

The reaction tube T′ for effecting the combination of nitrogen and hydrogen to produce ammonia is spaced from the outer pressure-resisting tube T by an annular jacket of molten material in which heat-insulating material is immersed. The tube *t* serves for conveying electric current into the apparatus for starting or promoting the reaction, and also for conveying



140,089

the gaseous mixture which passes downwards to the outlet O. The tube is provided with a series of supporting bars for the catalyst and with earthenware discs D to prevent short-circuiting, and the tube is coiled at the top to provide a heat interchanger. The coiled portion may be thicker, or made of a better conductor, or may be short-circuited, to prevent overheating of the gas. When in use, a heavy current of low voltage is used to produce a temperature gradient through the space between the tubes T and T′ similar to that obtained during normal working, so as to produce a uniform fusion of the protecting material.

140,371. CATALYTIC HYDROGENATION. Nordiske Fabriker De-No-Fa Aktieselskap, 41, Karl Johans Gate, Christiania. International Convention date, March 17, 1919.

Unsaturated organic compounds such as fatty a ids and their esters are hydrogenated by means of a catalyst con-

sisting of an aluminate of nickel precipitated in a carrier, such as kieselguhr. To prepare the catalyst, solutions of nickel sulphate and sodium aluminate are mixed, and the precipitated nickel aluminate is washed and then dried at 300°-400°C. in a current of hydrogen.

140,387-8. VULCANISING INDIARUBBER. G. Bruni, Milan, Italy. International Convention dates, March 15, 1919, and March 19, 1919.

140,387. The amount of sulphur used in vulcanising natural or synthetic indiarubber is reduced to 2—0·2 per cent., the remainder being replaced by salts of mono- or di-substituted dithiocarbamic acids and di- or tri-valent metals or inorganic radicles. Mineral oxides, reclaimed indiarubber, &c., may be added.

140,388 is a Patent of Addition to 140,387. The salts mentioned above are added to a mixture containing the usual quantity of sulphur, and the vulcanisation may be effected at a lower temperature or in a shorter time. As an example, 100 parts indiarubber, 8 parts sulphur, and 1 part pentamethylene dithiocarbamate of zinc may be vulcanised in from 5 minutes at 120°C. to a few days at air temperature.

140,394. NITROGEN COMPOUNDS. Nitrogen Corporation, 55, Canal Street, Providence, R.I., U.S.A. (Assignees of J. C. Clancy, Niagara Falls, N.Y., U.S.A.). International Convention date, September 1, 1917.

Nitrogen compounds, such as cyanogen, hydrocyanic acid, or ammonia are prepared by passing gaseous mixtures containing the necessary constituents over a nitrogenous catalyst such as barium cyanamide, or cyanide or cyanamide of titanium, vanadium, tungsten, uranium, nickel, manganese, chromium, or an alkali cyanide. The barium cyanamide is prepared in a porous form by heating barium cyanide in nitrogen at 400°-500°C. The catalyst may alternatively consist of porous barium cyanamide mixed with cyanides, cyanamides, or hydrides of the metals. Hydrocyanic acid, cyanogen, &c., may be produced at atmospheric pressure, but the pressure is preferably 100-1,000 lb. per square inch.

140,439. SYNTHETIC AMMONIA. Nitrogen Corporation, 55, Canal Street, Providence, R.I., U.S.A. (Assignees of J. C. Clancy, Manhattan, New York). International Convention date, March 17, 1919.

Ammonia is produced synthetically by means of a catalyst consisting of an alkali or alkali-earth cyanamide, preferably mixed with one or more nitrogen carriers such as iron, cobalt, nithenium, osmium, vanadium, columbium, or tantalum. When a cyanamide is used alone the pressure should be kept at 100 atmospheres to prevent loss of the catalyst as hydrogen cyanide gas; if iron is added in intimate mixture the process may be conducted at atmospheric pressure. The cyanamide may be derived from a carbide or cyanide; the carbide is prepared by passing acetylene through a solution of calcium in liquid ammonia and has the formula CaC, giving ethylene when treated with water; the cyanide is prepared by passing hydrogen cyanide gas through a solution of calcium in liquid ammonia, when it precipitates as a white powder. The iron, &c., may be present in the form of a nitride, ferrocyanide, or ferricyanide, or as a compound containing nitrogen carriers, such as manganese ferrocyanide, ferric cobalticyanide, or manganese-iron cobaltocyanide. When calcium cyanamide is used it is purified from the commercial product.

Abstracts of Complete Specifications

122,829. ALUMINIUM NITRIDE, PROCESS OF PRODUCING. Armour Fertiliser Works, Union Stock Yards, Chicago, Ill., U.S.A. (Assignees of M. Shoeld, 1086, Spruce Street, Winnetka, Ill., U.S.A.). International Convention date, (U.S.A.), January 28, 1918.

Aluminium nitride is produced by heating briquettes composed of comminuted carbon, an aluminium compound, and a binder, in an electric furnace in an atmosphere containing nitrogen. The electric furnace is of the type in which the material is heated in a vertical shaft through which one electrode projects downwards, the other electrode being an annular ring of graphite surrounding the lower end of the first electrode. The briquettes are fed into the top of the furnace and pass slowly downwards by gravity, while a current of nitrogen with or without a small proportion of a non-oxidising gas is passed vertically upwards through the column of briquettes. The incoming gas passes upwards through the hot solid material which is being discharged, and is thus preheated, while the hot gas after passing through the reaction zone heats the incoming solid material. The current passes radially through the hollow column of briquettes and a uniform heating is thus obtained.

141,401. MORDANT-DYEING DISAZO-DYESTUFFS AND THEIR APPLICATION IN DYEING AND PRINTING. O. Imray, London. (From Society of Chemical Industry in Basle, Basle, Switzerland). Application date, December 10, 1918.

A mono-azo-dyestuff of the general formula

$$R\begin{cases}COOH\\N=N\end{cases}R'\begin{cases}COOH\\NH_2\end{cases}$$

where R and R′ represent aryl residues,

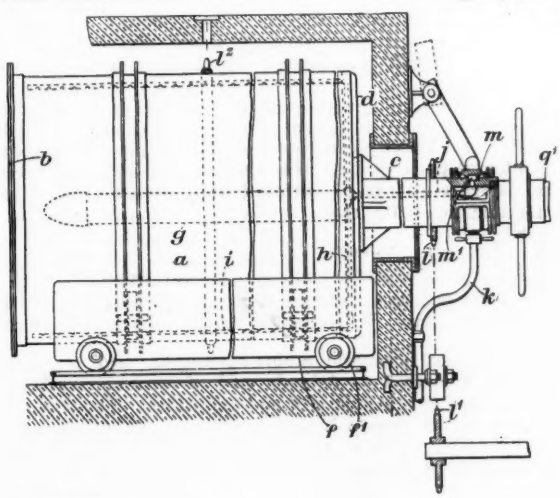
is diazotised and coupled with an amino-naphtholsulphonic acid, an acetyl-amino-naphtholsulphonic acid, or a pyrazolone containing a carboxyl group or a carboxyl group and a hydroxyl group in the aryl residue. A number of examples of the production of such disazo-dyestuffs are given. The dyes may be printed on cotton with chromium acetate yielding fast yellow to red or blue tints.

141,412. VULCANISING NATURAL AND ARTIFICIAL CAOUTCHOUC AND CAOUTCHOUC-LIKE SUBSTANCES, PROCESS OF. L. Gaisman, Spring Bank House, Woodley, Stockport, and J. L. Rosenbaum, 11, Trafalgar Square, Ashton-under-Lyne. Application date, January 10, 1919.

It is found that the vulcanisation of natural and artificial caoutchouc may be accelerated by the addition of the colour bases of the basic synthetic organic dyes. In one example, 57 parts of rubber, 40 parts of zinc oxide, and 3 parts of sulphur are mixed with 1 part of auramine O, which is a salt of imido-tetramethyl-diamido-diphenyl-methane. The mixture is vulcanised for one hour at a pressure of 40 lb. per square inch, and a white rubber is obtained. Examples are given of the similar use of other dyes many of which give a uniform colouration throughout the vulcanised mass.

141,417. DESTRUCTIVE DISTILLATION OF WOOD, WOODY FIBRE AND SIMILAR CARBONACEOUS SUBSTANCES. P. Poore, 1-4, Paternoster Row, London, E.C. Application date, January 11, 1919.

The apparatus is for the destructive distillation of wood and similar carbonaceous substances to obtain a high yield of



141,417

acetic acid and other distillates. A large cylindrical retort *a* is provided with a removable cover *b* at one end, and a vapour discharge pipe *c* at the oth r end attached to the plate *d*. The retort is mounted on a cradle *f* running on wheels *f′* so that it may be withdrawn for charging and discharging. A perforated concentric outlet pipe *g* is provided, and is secured

to a partition *h* close to the end plate *d*, and forming with it a chamber into which the gas is discharged before passing to the outlet pipe *c*. Superheated steam is admitted into the retort through a number of perforated pipes *i* connected to a supply pipe *j* within the pipe *c*. The retort is rotated periodically or continuously by means of a chain wheel *l* on the pipe *c* driven from a wheel *l'*, or alternatively, by means of a chain wheel l^2 mounted on the retort. The vapour discharge pipe *c* rotates within a stationary ring *m*, having an annular recess *m'* communicating with the steam pipe *j* and supplied with steam through the pipe *k*. The pipe *c* may be connected to a flexible pipe *q'*, the opposite end of which may be supported in a bearing not shown, and may be fitted within a socket on the fixed discharge main. The retort is supported on rollers f^2 carried by the cradle *f*.

141,440. COLOURLESS ORGANIC COMPOUNDS, MANUFACTURE OF. South Metropolitan Gas Co., 709, Old Kent Road, London, and H. Stanier, Ivy Cottage, Saverley Green, Blythe Bridge, Stoke-on-Trent. Application date, January 18, 1919.

The object is to produce aromatic compounds such as phenols, amino compounds and their sulphonic and carboxylic acids, free from the small quantities of coloured impurities which usually accompany them. The finished compound is treated with a small quantity of a hydrosulphite or a stable derivative thereof of the kind known as a sulphoxylate, which removes the colour, the effect being accelerated by heating. The product is dissolved or suspended in a solvent for hydrosulphite, and is subsequently recovered from the solution which contains any excess of hydrosulphite. Alternatively, the hydrosulphite may be added in the course of manufacture of the aromatic compound. Examples are given of the treatment of β-naphthol, benzidine, sulphanilic acid, &c.

141,505. DESTRUCTIVE DISTILLATION, PROCESS OF. O. F. Stafford, care of University of Oregon, Eugene, Ore, U.S.A. Application date, April 14, 1919. Addition to 119,040.

In Specification 119,040, a process is described in which comminuted wood or sawdust is previously dried by heating to 100°-250°C., and then placed in a retort heated to a temperature above 280°C., and preferably about 400°C. An exothermic action then proceeds, and the wood is carbonised and by-products are produced. It is now found that the same process is applicable to cotton seed hulls, rice hulls, peat, nut shells, fruit pips, straw, vegetable fibre, bagasse, moss, and other cellulosic materials.

141,572. PURIFIERS EMPLOYED IN GAS WORKS. R. and J. Dempster, Ltd., and G. F. H. Beard, Gas Plant Works, Oldham Road, Manchester. Application date, June 30, 1919.

The conduits for directing the gas through the boxes have walls forming part of those of the purifier, and the valve chambers are arranged so that the walls of the purifier boxes are integral parts of both the conduits and valve chambers. The valves are situated within the boxes and are in open communication with them, while they are also adjacent to the conduits.

141,643. MONO-AZO-DYESTUFFS, MANUFACTURE OF. O. Imray, London. (From the Society of Chemical Industry in Basle, Basle, Switzerland. Application date, December 10, 1918.

A diazotised aromatic amino-carboxylic acid is coupled with the N-methyl-ω-sulphonic acid of an amino-carboxylic acid, capable of being coupled and diazotised. The N-methyl-ω-sulphonic acid group is then eliminated in known manner, *e.g.*, by boiling with dilute caustic soda lye. The resulting mono-azo-dyestuff of the general formula

$$R{-}N{=}N{-}R'\begin{cases}COOH\\NH_2\end{cases}\quad COOH$$

(where R is an aromatic radicle) is then isolated and salted out. The production of 4-amino-azo-benzene-3:3'-dicarboxylic acid and similar compounds is described. These dyes give yellow to orange colours on wool and are suitable for chrome printing on cotton.

LATEST NOTIFICATIONS.

142,806. Resin from naphthas. Barrett Co. May 5, 1919.
142,836. Electric crucible ovens. C. Soncini. April 25, 1919.
142,854. Lead and silver from sulphide ores and metallurgical products, Recovery of. Amalgamated Zinc (De Bavay's), Ltd. May 6, 1919.
142,859. Gasoline, Process for cleaning. De Laval Separator Co. September 23, 1918.
142,860. Centrifugal separator. De Laval Separator Co. August 31, 1917.
142,865. Fat, ossein, and calcium phosphate of bones, Method of separating—by means of aqueous solutions of sulphurous anhydride, and of salts of sulphuric acid. U. Busico. March 11, 1919.

Specifications Accepted, with Date of Application

119,647. Alkali Chromates, Process for isolating or purifying. Soc. Industrielle de Produits Chimiques. August 2, 1917.
124,191. Pure concentrated nitric acid and tetroxide of nitrogen, Production of. Norsk Hydro-Elektrisk Kvaelstofaktieselskab. March 13, 1918.
126,961. Mercury, Process for decomposing—and obtaining radium and gold, which are contained in the formation of this metal. G. B. Perez. May 15, 1918.
128,215. Cellulose acetate, Manufacture of solutions of—and of celluloid-like masses, films, and other products or articles produced therewith. H. Drefus. March 4, 1914.
130,619. Nitrocellulose, Process for the purification of. H. Duclaux. August 25, 1913.
135,844. Ores, Treatment of fine. Dorr Co. August 16, 1918.
141,766. Nickel salt, Method of and apparatus for electrolysing a solution of. C. Heberlein. October 29, 1918.
141,787. Sulphate of ammonia, Manufacture of. S. E. Linder and R. Lessing. January 18, 1919.
141,798. Ammonium sulphate, Manufacture of. South Metropolitan Gas Co., E. V. Evans and H. Hollings. January 20, 1919.
141,799. Sulphate of ammonia, Manufacture of. South Metropolitan Gas Co. and O. W. Weight. January 20, 1919.
141,819. Sulphate of ammonia, Manufacture of neutral. South Metropolitan Gas Co., P. Parrish and W. A. Valon. January 23, 1919.
141,828. Gas from coal or like carbonaceous material, Method of manufacturing. C. E. Holt and T. Walker. February 4, 1919.
141,864. Fractionating air, Methods of and apparatus for. British Thomson-Houston Co. (*General Electric Co.*) March 14, 1919.
141,908. Silicon, boron or titanium, Production of fluid halogen compounds of. British Thomson-Houston Co. (*General Electric Co.*) April 23, 1919.
141,925. Barium carbonate, Manufacture of finely-subdivided. H. Langwell. May 10, 1919.
141,942. Caustic soda or other matter required to be obtained in a state of division, Apparatus for the manufacture of detached or flake—from a fused or molten mass. T. Minton and United Alkali Co. May 23, 1919.

Applications for Patents

Ashcroft, E. A. Anhydrous magnesium chloride or double chlorides. 13,061. May 11.
Blom, A. V. Effecting condensation reactions. 13,055. May 11.
Craig, T. J. I. Purification of sulphur. 13,293. May 13.
Dreyfus, H. Cellulose derivatives. 13,289, 13,290. May 13.
Duckham, Sir A. M. Gasification of fuel. 12,937. May 10.
Duckham, Sir A. M. Gasification of fuel. 13,373. May 14.
Emerson, V. L. Apparatus for distillation. 12,922. May 10. (U.S.A., May 8, 1919.)
Farbenfabriken vorm. F. Bayer & Co. Dyeing with acid sulpho amino dyestuffs. 13,161. May 12. (Germany, October 31, 1914.)
Félizat, G. L. Destructive distillation of schists, shales, &c. 12,951. May 10. (France, April 12, 1919.)
Fuller-Lehigh Co. Conveying pulverised material. 12,959. May 10. (U.S.A., October 8, 1919.)
Guignard, G. P. Destructive distillation of schists, shales, &c. 12,951. May 10. (France, April 12, 1919.)
Hickman, K. Fixation of nitrogen. 13,348. May 14.

Monthly Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co. and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

British Market Report

WEENESDAY, May 19.

Business has not been so active during the current week, doubtless due to the approach of the Whitsun Holidays. On the other hand, prices continue firm and supplies scarce.

With regard to export business this shows a better tone on the whole, and much more business could be transacted f supplies could only be obtained.

General Chemicals

ACETONE is scarce, but price is nominally without change.

ACID ACETIC has been more active, and available supplies are quickly absorbed.

ACID CARBOLIC is quietly firm, and without change.

ACID FORMIC is active, especially on export account, and price is without change.

ACID LACTIC is stagnant, and there is little to report.

ACID OXALIC continues firm, and there appears to be slightly more material available at the moment.

ACID TARTARIC.—Very good business has been transacted at prevailing figures.

AMMONIUM SALTS are nominally without change, but prices are well maintained, and makers are fully occupied.

ARSENIC is quietly steady at recent figures.

BARIUM SALTS are not so active, and chloride appears to be a shade easier.

BLEACHING POWDER.—There is no relief to the present position, and the material is practically unobtainable on export account.

CALCIUM ACETATE is scarce and price firm.

COPPER SULPHATE.—There is nothing to report, and the market still continues lifeless.

FORMALDHYDE is quiet, but price is nominally without change.

IRON SULPHATE (Green Copperas) is moving off satisfactorily without change in value.

LEAD SALTS have been more active, and there are no price changes to report.

LITHOPONE is in slightly better supply, and the price is a shade easier.

MAGNESIUM SALTS are all very active, and some very good business has been transacted on export account for sulphates.

POTASSIUM BICHROMATE is extremely scarce.

POTASSIUM CARBONATE is moving off very well at last quoted figures.

POTASSIUM NITRATE is in better supply, and the price may be said to be a shade easier.

POTASSIUM PERMANGANATE continues scarce for B.P. material.

POTASSIUM PRUSSIATE is in short supply, and moving off very well at last quoted figures.

SODIUM ACETATE is without change and slow of sale.

SODIUM CAUSTIC is in good request on export account, but there is no change in value.

SODIUM HYPOSULPHITE is almost unobtainable, and price is again higher.

SODIUM NITRITE is perhaps in slightly better supply, but value is well maintained.

SODIUM PHOSPHATE is firm, with good business passing.

SODIUM PRUSSIATE is quiet, and price inclined to weaken.

SODIUM SULPHIDE.—There is no relief to the present abnormal position, and there is much more business being offered t han can be accommodated.

TIN SALTS are all quiet.

ZINC SALTS are quietly steady.

Coal Tar Intermediates

Business has been very brisk in most intermediates, and some good export orders have been received, the position as regards delivery is still acute for most products.

ALPHANAPHTHYLAMINE is extremely scarce, and the price is without change.

BETA NAPHTHOL continues in request, and the price shows a tendency to still further advance.

DIPHENYLAMINE is wanted, but supplies are very short.

NAPHTHIONIC ACID continues in request at last quoted price.

PARAPHENYLENE DIAMINE.—A moderate business has been transacted.

PHTHALIC ACID ANHYDRIDE is in better supply, but business is only moderate.

SALICYLIC ACID is in fair request, but without change in price.

Coal Tar Products

The markets generally are firm, with one or two exceptions, but business is somewhat difficult owing to the uncertainty with regard to Export licences.

90's BENZOL is in good demand at 2s. 7½d. to 2s. 8d. per gallon on rails.

PURE BENZOL is scarce with few sellers at 3s. 4d. per gallon.

CREOSOTE OIL is in good demand at 1s. to 1s. 1d. in the North, and 1s. 1d. to 1s. 2d. in the South.

SOLVENT NAPHTHA, 90/160, is rather slow of sale, and there are sellers at 2s. 9d. per gallon.

HEAVY NAPHTHA, 90/190, is in good demand at 3s. 4d. to 3s. 6d. per gallon.

NAPHTHALENE remains scarce, and the prices are somewhat irregular. Crude is worth £15 to £22 per ton according to quality, and refined £36 to £40 per ton. Some sellers are asking as much as £50 per ton.

PITCH.—The market continues firm, and there is a good demand for next season's deliveries. Business is being done at 160s. to 165s. f.o.b. East Coast, and there are very few sellers on the West Coast at much under these prices.

Sulphate of Ammonia

The Home demand continues good, and some parcels have been sold for export at prices fixed by the Control.

French Market Report

This market is rather quiet, and there is not much business to be noted at the moment. There are also Labour difficulties in some quarters.

Import has been largely restricted by Government regulations, and to this no doubt can be attributed in part the improvement in the value of the franc, and this should before very long have its effect on the demand for chemical products.

A good business is passing in all soda products, good prices being paid for caustic soda, while soda ash has been largely purchased at fancy prices.

OXALIC ACID is scarce, and the price nominally at 11 francs per kilo.

SODIUM BICHROMATE stands at 1,100 francs.

BICHROMATE OF POTASH at 1,600 francs.

BORAX CRYSTALS has now advanced to 230 francs.

FORMALDEHYDE has been quiet at 2,000 francs.

LITHOPONE is easier at 400 francs.

YELLOW PRUSSIATE OF POTASH stands at 1,100 francs.

YELLOW PRUSSIATE OF SODA is in short supply, and the price is nominally 600 francs.

EPSOM SALTS are in better supply, and the price easier at 75 francs per 100 kilos.

SULPHATE OF ZINC is quiet, and the price is 100 francs per 100 kilos.

SODIUM SULPHIDE, both concentrated and crystals, are almost unobtainable, and fancy prices are offered for any spot parcels.

German Market Report

This market has been weak, consumers refraining from buying to a large extent. More suitable market conditions, however, are now expected, as speculators are now being eliminated, the Government measures forcing them to liquidate their holdings.

There has been a slump in some imported products, and manufacturers have taken advantage of this.

South West Germany appears to have now quieted down, and works are increasing their output.

Many prices have been advanced to meet the wage increases, and higher prices still are expected. The Government is now collecting the necessary statistics regarding production, in order to be in a position to fulfil their Peace Treaty obligations.

CHINA CLAY is in great request.

SODIUM PRODUCTS are extremely scarce, caustic soda in particular, large quantities being imported from England.

POTASSIUM PRUSSIATE is in request, and is being sold at 60 marks per kilo.

POTASSIUM ALUM is scarce, and is worth 6.50 marks.

BARIUM CHLORIDE has been freely offered at 210 marks per 100 kilos.

BORIC ACID POWDER is scarce at 34 marks per kilo.

BICHROMATE OF POTASH is practically unobtainable, and 80 marks per kilo has been paid.

ACETONE is wanted, and is worth 45 marks per kilo.

OXALIC ACID is in better supply, but the price is high at 52 marks.

SALICYLIC ACID is in request at about 90 kilos.

CREAM OF TARTAR is wanted at 62 marks.

SODIUM BICARBONATE is extremely scarce, and business is being done on the basis of 3 marks per kilo.

Current Prices

Chemicals

	per	£	s	d.		£	s	d.
Acetic anhydride	lb.	0	3	6	to	0	3	9
Acetone oil	ton	90	0	0	to	95	0	0
Acetone, pure	ton	120	0	0	to	125	0	0
Acid, Acetic, glacial, 99-100%	ton	120	0	0	to	122	10	0
Acetic, 80% pure	ton	97	0	0	to	98	10	0
Arsenic	ton	100	0	0	to	105	0	0
Boric, cryst.	ton	74	10	0	to	76	0	0
Carbolic, cryst. 39-40%	lb.	0	1	3	to	0	1	3½
Citric	lb.	0	6	9	to	0	7	0
Formic, 80%	ton	125	0	0	to	130	0	0
Gallic, pure	lb.	0	7	3	to	0	7	9
Hydrofluoric	lb.	0	0	7	to	0	0	8
Lactic, 50 vol.	ton	63	0	0	to	67	0	0
Lactic, 60 vol.	ton	78	0	0	to	83	0	0
Nitric, 80 Tw.	ton	41	0	0	to	44	0	0
Oxalic	lb.	0	2	11	to	0	3	0
Phosphoric, 1.5	ton	65	0	0	to	67	0	0
Pyrogallic, cryst	lb.	0	11	6	to	0	11	9
Salicylic, Technical	lb.	0	2	10	to	0	3	0
Salicylic, B.P.	lb.	0	3	8	to	0	3	10
Sulphuric, 92-93%	ton	8	0	0	to	8	10	0
Tannic, commercial	lb.	0	5	0	to	0	5	3
Tartaric	lb.	0	4	0	to	0	4	2
Alum, lump	ton	19	10	0	to	20	0	0
Alum, chrome	ton	93	0	0	to	95	0	0
Alumino ferric	ton	9	0	0	to	9	10	0
Aluminium, sulphate, 14-15%	ton	17	10	0	to	18	10	0
Aluminium, sulphate, 17-18%	ton	20	10	0	to	21	10	0
Ammonia, anhydrous	lb.	0	1	9	to	0	2	0
Ammonia, .880	ton	32	10	0	to	37	10	0
Ammonia, .920	ton	20	0	0	to	24	0	0
Ammonia, carbonate	lb.	0	0	7½	to		—	
Ammonia, chloride	ton	115	0	0	to	120	0	0
Ammonia, muriate (galvanisers)	ton	60	0	0	to	65	0	0
Ammonia, nitrate	ton	60	0	0	to	65	0	0
Ammonia, phosphate	ton	130	0	0	to	135	0	0
Ammonia, sulphocyanide	lb.	0	2	3	to	0	2	6
Amyl, acetate	ton	360	0	0	to	370	0	0
Arsenic, white, powdered	ton	67	10	0	to	70	0	0
Barium, carbonate	ton	13	10	0	to	14	10	0
Barium, carbonate, 92-94%	ton	14	10	0	to	15	0	0
Chlorate	lb.	0	1	4	to	0	1	5
Chloride	ton	36	0	0	to	37	0	0
Barium, Nitrate	ton	55	0	0	to	56	0	0
Sulphate, blanc fixe, dry	ton	25	10	0	to	26	0	0
Sulphate, blanc fixe, pulp	ton	15	10	0	to	16	0	0
Bleaching powder, 35-37%	ton	18	10	0	to	19	10	0
Borax crystals	ton	41	0	0	to	42	10	0

	per	£	s.	d.		£	s.	d.
Calcium acetate, Brown	ton	20	0	0	to	21	0	0
Grey	ton	35	0	0	to	37	10	0
Carbide	ton	30	0	0	to	32	0	0
Chloride	ton	9	10	0	to	10	10	0
Carbon bisulphide	ton	58	0	0	to	59	0	0
Casein, technical	ton	80	0	0	to	83	0	0
Cerium oxalate	lb.	0	3	9	to	0	4	0
Chromium acetate	lb.	0	1	2	to	0	1	4
Cobalt acetate	lb.	0	7	3	to	0	7	6
Oxide, black	lb.	0	7	9	to	0	8	0
Copper chloride	lb.	0	1	3	to	0	1	6
Sulphate	ton	46	0	0	to	47	0	0
Cream Tartar, 98-100%	ton	300	0	0	to	305	0	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde 40% vol.	ton	345	0	0	to	350	0	0
Formusol (Rongalite)	lb.	0	4	0	to	0	4	3
Glauber salts	ton	Nominal.						
Glycerine, crude	ton	70	0	0	to	72	10	0
Hydrogen peroxide, 12 vols.	gal.	0	2	8	to	0	2	9
Iron perchloride	ton	50	0	0	to	52	0	0
Iron sulphate (Copperas)	ton	4	15	0	to	5	0	0
Lead acetate, white	ton	95	0	0	to	97	10	0
Carbonate (White Lead)	ton	75	0	0	to	77	10	0
Nitrate	ton	72	0	0	to	75	0	0
Litharge	ton	62	10	0	to	65	0	0
Lithopone, 30%	ton	59	0	0	to	61	0	0
Magnesium chloride	ton	15	10	0	to	16	10	0
Carbonate, light	cwt	2	15	0	to	3	0	0
Sulphate (Epsom salts commercial)	ton	14	0	0	to	14	10	0
Sulphate (Druggists')	ton	18	10	0	to	19	10	0
Manganese, Borate	ton	190	0	0	to		—	
Sulphate	ton	105	0	0	to	110	0	0
Methyl acetone	ton	95	0	0	to	100	0	0
Alcohol, 1% acetone	gall.	Nominal.						
Nickel ammonium sulphate, single salt	ton	50	0	0	to	52	10	0
Potassium bichromate	lb.	0	2	2	to	0	2	3
Potassium Carbonate, 90%	ton	102	0	0	to	105	0	0
Chloride	ton	Nominal.						
Chlorate	lb.	0	0	10	to	0	0	10½
Meta-bisulphite, 50-52%	ton	270	0	0	to	280	0	0
Nitrate, refined	ton	70	0	0	to	72	0	0
Permanganate	lb.	0	5	9	to	0	6	0
Prussiate, red	lb.	0	6	3	to	0	6	6
Prussiate, yellow	lb.	0	2	3½	to	0	2	4½
Sulphate, 90%	ton	31	0	0	to	33	0	0
Salammoniac, firsts	cwt.	5	15	0	to		—	
Seconds	cwt.	6	0	0	to		—	
Sodium acetate	ton	61	0	0	to	63	0	0
Arsenate, 45%	ton	60	0	0	to	62	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	2	0	to	0	2	1
Bisulphite, 60-62%	ton	50	0	0	to	52	10	0
Chlorate	lb.	0	0	5¾	to	0	0	6¼
Caustic, 70%	ton	43	10	0	to	44	10	0
Caustic, 76%	ton	44	10	0	to	45	10	0
Hydrosulphite, powder, 85%	lb.	0	3	9	to	0	4	0
Hyposulphite, commercial	ton	37	10	0	to	40	0	0
Nitrite, 96-98%	ton	120	0	0	to	125	0	0
Phosphate, crystal	ton	39	0	0	to	41	0	0
Perborate	lb.	0	2	2	to	0	2	4
Prussiate	lb.	0	1	9	to	0	1	9½
Sulphide, crystals	ton	30	0	0	to	32	0	0
Sulphide, solid, 60-62%	ton	55	0	0	to	57	0	0
Sulphite, cryst.	ton	15	10	0	to	16	10	0
Strontium carbonate	ton	85	0	0	to	90	0	0
Nitrate	ton	90	0	0	to	95	0	0
Sulphate, white	ton	8	10	0	to	10	0	0
Sulphur chloride	ton	42	0	0	to	44	10	0
Sulphur, Flowers	ton	24	0	0	to	26	0	0
Roll	ton	24	0	0	to	26	0	0
Tartar emetic	lb.	0	3	5	to	0	3	6
Tin perchloride, 33%	lb.	0	2	6	to	0	2	7
Perchloride, solid	lb.	0	3	0	to	0	3	3
Protochloride (tin crystals)	lb	0	2	0	to	0	2	1
Zinc chloride, 102 Tw.	ton	22	0	0	to	23	10	0
Chloride, solid, 96-98%	ton	60	0	0	to	65	0	0
Oxide, 99%	ton	82	10	0	to	85	0	0
Oxide, 94-95%	ton	70	0	0	to	72	10	0
Dust, 90%	ton	90	0	0	to	92	10	0
Sulphate	ton	21	10	0	to	23	10	0

Coal Tar Intermediates, &c.

	per	£	s.	d.		£	s.	d.
Alphanaphthol, crude	lb.	0	4	0	to	0	4	3
Alphanaphthol, refined	lb.	0	5	0	to	0	5	3
Alphanaphthylamine	lb.	0	4	0	to	0	4	3
Aniline oil, drums extra	lb.	0	1	5	to	0	1	6

	per	£	s.	d.		£	s.	d.
Aniline salts	lb.	0	1	10	to	0	2	0
Anthracene, 85-90%	lb.		—		to		—	
Benzaldehyde (free of chlorine)	lb.	0	5	6	to	0	6	0
Benzidine, base	lb.	0	12	6	to	0	13	6
Benzidine, sulphate	lb.	0	10	0	to	0	11	0
Benzoic, acid	lb.	0	5	6	to	0	6	0
Benzoate of soda	lb.	0	5	6	to	0	6	0
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol benzoate	lb.	1	6	0	to	1	7	6
Betanaphthol	lb.	0	5	3	to	0	5	6
Betanaphthylamine, technical	lb.	0	8	6	to	0	9	6
Croceine Acid, 100% basis	lb.	0	5	0	to	0	6	3
Dichlorbenzol	lb.	0	0	6	to	0	0	7
Diethylaniline	lb.	0	7	9	to	0	8	6
Dinitrobenzol	lb.	0	1	5	to	0	1	6
Dinitrochlorbenzol	lb.	0	1	5	to	0	1	6
Dinitronaphthaline	lb.	0	1	4	to	0	1	6
Dinitrotoluol	lb.	0	1	8	to	0	1	9
Dinitrophenol	lb.	0	3	6	to	0	3	9
Dimethylaniline	lb.	0	5	0	to	0	5	3
Diphenylamine	lb.	0	5	0	to	0	5	3
H-Acid	lb.	0	14	0	to	0	14	6
Metaphenylenediamine	lb.	0	5	9	to	0	6	0
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	7	6	to	0	8	6
Monosulphonic Acid (2:7)	lb.	0	7	6	to	0	8	0
Naphthionic acid, crude	lb.	0	5	6	to	0	6	0
Naphthionate of Soda	lb.	0	6	0	to	0	6	6
Naphthylamin-di-sulphonic-acid	lb.	0	5	6	to	0	6	6
Nitronaphthaline	lb.	0	1	3	to	0	1	4
Nitrotoluol	lb.	0	1	4	to	0	1	6
Orthoamidophenol, base	lb.	0	18	0	to	1	0	0
Orthodichlorbenzol	lb.	0	1	2	to	0	1	4
Orthotoluidine	lb.	0	2	6	to	0	2	9
Orthonitrotoluol	lb.	0	1	7	to	0	1	8
Para-amidophenol, base	lb.	0	15	0	to	0	16	0
Para-amidophenol, hydrochlor	lb	0	15	6	to	0	16	0
Paradichlorbenzol	lb.	0	0	6	to	0	0	8
Paranitraniline	lb.	0	8	3	to	0	8	9
Paranitrophenol	lb.	0	2	6	to	0	2	9
Paranitrotoluol	lb.	0	5	3	to	0	5	6
Paraphenylenediamine, distilled	lb.	0	13	6	to	0	14	6
Paratoluidine	lb.	0	7	6	to	0	8	6
Phthalic anhydride	lb.	0	5	6	to	0	6	0
R. Salt, 100% basis	lb.	0	4	0	to	0	4	2
Resorcin, technical	lb.	0	11	6	to	0	12	6
Resorcin, pure	lb.	0	17	6	to	1	0	0
Salol	lb.	0	5	9	to	0	6	0
Shaeffer acid, 100% basis	lb.	0	3	6	to	0	3	0
Sulphanilic acid, crude	lb.	0	1	5	to	0	1	6
Tolidine, base	lb.	0	10	6	to	0	11	6
Tolidine, mixture	lb.	0	3	0	to	0	3	6

Chemical Trade Inquiries

Locality of Firm or Agent.	Materials.	Ref. No.
Canada (Montreal)	Glassware	684
New Zealand ...	Glassware	—
Germany... ... (Hamburg)	Olive Oil	692
Morocco (Fez) ...	Candles	705
Latin America ... (Valparaiso)	Drugs	—
Africa (Algiers) ...	Tin, zinc, iron and steel	704
New Zealand ... (Auckland)	Caustic Soda; Soda Ash; Household Salt	—
Norway ... ... (Christiania)	Chemicals; Asbestos	732
Nigeria (Lagos) ...	Drugs	718
Canada	Colours as Used in the Lithographic and Writing Ink Industry	—

The British Chemical Trade Association announces that Dr. Morales, manager of Bennaton, Morales & Co., San Pedro Sula, Honduras, C.A., is at present in London for the purpose of purchasing drug store goods for America. Communications to the B.C.T.A.

Book Received

Animal and Vegetable Oils, Fats and Waxes. By Geoffrey Martin. Crosby, Lockwood & Son. London. Pp. 218. 12s. 6d. net.

Iron and Steel Institute

Annual Meeting at Sheffield

The adjourned annual meeting of the Iron and Steel Institute was held on Friday, May 14, in the Mappin Hall of the University of Sheffield, Dr. J. Stead, the new president, in the chair. On the previous evening a number of the exhibits and demonstrations presented last week at the London meeting were shown. Reference was made to the first award of the Blacksmiths' Company gold medal and freedom of their guild for this year, the Council of the Institute having recommended, as the first recipient of this honour, Mr. W. H. Cathcart, research metallurgist with F. Lobnitz & Co., Renfrew, for the valuable work he has done in metallurgy and the lectures to his fellow smiths included in his book, "Science in the Smithy and Forge."

Alloy Steels

The papers contributed dealt chiefly with the methods of attaining the most satisfactory results from properly heat-treating several forms of alloy steels, and the "Effect of Initial Temperature upon the Physical Properties" was described by Messrs. Andrew, Rippon and Wragg. Nickel, chromium and nickel-chrome steels were tested for thermal, dilation and resistivity changes for different quenching temperatures which merely stereotypes the carbide condition, and thus controls the allotropic change. Martensite was shown to be formed when the allotropic change is depressed by dissociated carbide to a temperature at which the latter is able to exist as such in the alpha-iron formed. By tempering the austenite in quenched steel in such a way that the carbide becomes partially associated the allotropic change is able to take place on recooling, thus explaining the phenomenon of secondary hardening. It was shown that in carbon steels quenched from 1,000°C. the iron is in the alpha state, but in alloys steels with high carbon content the iron is in the gamma state in large proportions, and in extreme cases alpha iron is entirely absent.

Professor C. A. Edwards, in collaboration with several of his assistants at Manchester University, presented two papers on the "Properties of Chromium Steels," dealing first with the thermal analysis and mapping the constitutional diagram, and then studying the "Effect of Heat Treatment on the Electrical Resistivity." In the annealed condition chromium raises the resistivity of iron by 3·75 microhms for each 1 per cent. in excess of 4·3 times the carbon content. Quenching experiments show a critical range at about 1,000°C., and tempering experiments showed that there are two distinct temperatures at which the carbides fall out of solution. After quenching it appears that chromium increases the resistivity of iron by 5·1 microhms per cubic centimetre for each 1 per cent. held in solution. Mr. J. H. Monypenny, of Sheffield, contributed a paper well illustrated by micrographs to show the "Structure of some Useful Chromium Steels."

Messrs. K. Honda and T. Murakami contributed an abstract from their report to the Japanese Iron and Steel Research Institute, dealing with the "Hardening and Tempering of High-Speed Steel containing Chromium and Tungsten." The self-hardening of these steels when air cooled from a sufficiently high temperature was due to the lowering of the thermal transformations. The resistance to tempering depends upon the amount of dissolved chromium carbide, and self-hardening increases with the increased maximum temperature or rate of cooling. Tungsten diminishes the temperature at which, during cooling, the self-hardening property of the steels begins to take place. Tungsten exceeding 12 per cent. exists as fine globules of tungstide, and these behave in tool steel like saw-teeth in increasing the cutting efficiency rather than intensifying its hardness. The tungstide in high-speed steels segregates as a eutectic during the cooling from the melt. In a tool steel the globules of the tungstide must be uniformly scattered throughout the whole mass.

Two other papers also taken were by Mr. F. Rogers on the "Brittleness of Nickel-Chrome and other Steels" under incorrect heat treatment, and by Mr. A. L. Norbury on "The Effect of Various Elements on the Electrical Resistivity of Iron."

The Reason Mfg. Co., Ltd., has applied for an extension of the terms of the patents granted to Henry Stafford Hatfield and the above company for patent No. 20,500 of 1905 for improvements in mercury electrolytes for electrolytic cells, and patent No. 20,770 of 1905 for improvements in cathodes.

Soap Transactions

Appeal by E. H. Jones & Meakin, Ltd.

In the Court of Appeal last week, Lords Justices Bankes, Scrutton and Atkin disposed of an appeal by E. H. Jones & Meakin, Ltd., merchants, of London, from a judgment of Mr. Justice Rowlatt in an action brought against them by Mr. J. H. Fish, formerly a traveller in the employment of Messrs. Watson, soap manufacturers, of Leeds.

The action related to transactions between the parties in connection with traders' "surplus" supplies of Sunlight and Watson's Matchless Cleanser soaps in the latter part of 1917 and the beginning of 1918. Mr. Justice Rowlatt gave judgment for the plaintiff upon his claim for £114, money expended by him for and on account of the defendants, and also upon his claim for an account of other moneys alleged to be due to him. His lordship further dismissed a counter-claim by the defendants for damages for alleged breaches of contract by the plaintiff to make deliveries of soap. It was from the judge's decision on the counter-claim that the defendants appealed.

"Not Creditable to Either"

Lord Justice Bankes, in giving judgment, said that the transactions in which the parties were engaged were not creditable to either of them. The story was that the plaintiff Fish, who was a traveller in Messrs. Watson's employment, in September and October, 1917, entered into a series of contracts with the defendants, by which he sold to them a very large quantity of Watson's soap which was not to be procured from his employers and a very considerable quantity of Sunlight soap, the purchase price of which ran into thousands of pounds. The plaintiff alleged that at an early date in October there was a variation of the terms under which the two parties were doing their business, and that instead of purchasing outright from the plaintiff the defendants, in substance, agreed to employ the plaintiff to procure soap for them as a joint adventure, he getting a certain proportion of the profits on the resale of the soap.

In spite of difficulties in the way of the plaintiff's case, the learned judge below was entitled to accept that case in preference to the defendants'. Here was a traveller making an entirely illegitimate use of his position, and the defendants were taking advantage of it. They were making money out of it, and they were dealing with a man who had not the resources wherewith to provide the soap or meet his commitments if the market went up. The market did go up, and, therefore, if the defendants desired to continue this illegitimate business, the only way to do it was to make some arrangement with the man which would not expose him to the obligation of financing the transaction.

The Lord Justice, therefore, came to the conclusion that there was a fresh arrangement which wiped out the plaintiff's obligations under the suggested original contracts. Upon this ground the appeal failed, and must be dismissed with costs. The other Lords Justices concurred.

An Unpleasant Case

Lord Justice Scrutton remarked that the case was a difficult, unpleasant and melancholy one. During the war there was a shortage of soap, and the manufacturers were apportioning their supplies partly for home consumption and partly for export, in respect of which latter enhanced prices were obtained. The defendants could not get soap for export from the manufacturers, so they entered into relations with a traveller of one of the soap manufacturers who was supplying soap to the home market, and it was arranged that the defendants should buy through the traveller goods supplied for home consumption. The soap manufacturers' comment upon the transaction was that immediately they heard of it, they requested the plaintiff Fish to resign his position as their traveller. It was lucky for Fish, added the Lord Justice, that he was not dismissed.

Grindley & Co.

In our issue of May 8 it was erroneously stated that this firm are the oldest makers of paints, varnishes, &c., in Great Britain. Grindley & Co. do not manufacture paints and varnishes, but only specialities for the paint and varnish trade, such as soluble driers, hardened resins, ester gums and concentrated varnishes in paste form.

Dispute Over Saccharine Purchase

A claim for £1,600, being the value of 200 lb. of saccharine, formed the subject of an action which came on for hearing before Mr. Justice Bailhache in the King's Bench Division on Monday. The plaintiffs were Gaston, Williams & Wynne, of Bishopsgate, E.C., and the defendant Mr. H. B. Hughes, oil and general merchant, of Buckingham Street, E.C.

Mr. Rigby Swift, K.C., for the plaintiffs, said the defence set up was that the goods were ordered for the defendant by an agent who had no authority to order. The plaintiffs carried on business in the City, and defendant carried on business as an oil and general merchant at Buckingham Street, and also at Mincing Lane. At the latter place the business was carried on by a manager named Modson. On March 31 Mr. Modson saw Mr. Norton, plaintiffs' representative, and bought from him 100 lb. of saccharine at 160s. per lb., making £800. In April he came again and bought another 100 lb. for £800. The goods were in warehouse and the firm who warehoused them handed over the goods to the nominee of the defendant.

Mr. Arthur E. Norton, formerly employed by the plaintiffs, was giving evidence, when Mr. Rigby Swift said he understood the defendant would consent to judgment for the amount claimed, with costs.

Mr. Wallington, for the defendant, said his client had a gentleman who had charge of a branch of the business. He apparently entered into the contracts for the purchase of the goods now sued upon. Not only had this gentleman no authority to do so, but defendant did not know of the transactions. What now appeared was that he deprived the defendant of certain other saccharine, and then bought the saccharine in this case on the defendant's credit. He applied the saccharine in this case to one of the defendant's contracts. The defendant did not know it, but he knew it now, and felt he could not do otherwise than submit to judgment.

His Lordship gave judgment for plaintiffs for £1,600, and costs.

Canada Carbide Co.'s Appeal Allowed

In the Court of Appeal on Monday, Lords Justices Bankes, Scrutton and Atkin allowed the appeal of the Canada Carbide Co. from an order of Mr. Justice Bailhache, refusing the appellants, who are defendants to an action by the Acetylene Corporation of Great Britain, Ltd., a commission to proceed to Canada to take evidence for the trial of the action. The plaintiffs claim damages for alleged breach of contract to deliver carbide and to give them control over the defendants' dealings in this country. It was stated that the damages claimed might reach a quarter of a million pounds, with a minimum of £100,000. The defendants plead an exception clause in the contract, under which they were not to be liable for contingencies over which they had no control, and they say they were restricted and hindered in manufacture and deliveries of the carbide by shortness of labour and embargoes on railway and transport difficulties, including lack of shipping space, all due to the war. The plaintiffs said the carbide was actually coming to them, but it was not for them but for account of the British Government, and that made all the difference to them.

Lord Justice Bankes, in giving judgment, said it was impossible without doing injustice to the defendants, to order a trial of the action without the commission to Canada which they asked for, in order to give them an opportunity of bringing such evidence as was available before the Court on the matters which they pleaded in their defence.

Benzol

Mr. Hope, in reply to Mr. Yeo (House of Commons, May 19), stated that the stock of benzol on November 11, 1918, which the Ministry of Munitions held or was under contract to acquire was approximately 11,700 tons of standard benzol and 9,800 tons of pure benzol. All the pure benzol was transferred to the Board of Trade and all the standard benzol was sold by October 7, 1919, with the exception of about 100 tons subsequently notified for disposal which was sold by March 20, 1920. The average price obtained for the standard benzol was 1s. 8½d. per gallon as it lay.

Company News

CASSEL CYANIDE.—An interim dividend has been declared of 9d. per share, less tax, against 6d. a year ago.

SANTA MARIA CONSOLIDATED OIL FIELDS.—A dividend of 3d. per share, being at the rate of 10 per cent. per annum, on instalments, on the preference shares, will be paid on June 1.

LIMMER & TRINIDAD LAKE ASPHALT CO.—The directors recommend that the capital be increased to £350,000, by the creation of 50,000 preference and 100,000 ordinary shares of £1 each, and that 50,000 new ordinary shares be offered to shareholders proportionately.

EXPLOSIVES TRADES.—The directors, having received particulars of the earnings of the constituent companies, recommend a dividend for the year 1919 on the ordinary shares at the rate of 10 per cent. and on the deferred shares at the rate of 5 per cent., both less tax.

SAN LORENZO NITRATE.—The report for the year 1919 states that the credit balance from last account was £18,123, less dividend paid May 29, 1919, 3s. per share, £3,600, £14,523; less loss for year 1919, £11,040, leaving £3,483, which the directors propose to carry forward.

BRITISH OXYGEN.—A further 100,000 ordinary shares of £1 each were offered this week to shareholders in the proportion of one new share for every three shares held on May 12. The new shares will rank for one-half the dividend declared for the year ending March 31, 1921.

CALICO PRINTERS' ASSOCIATION.—The directors announce that a settlement between the Association and the Treasury regarding excess profits duty for the year ended June 30 last has not been effected. Hence the year's accounts cannot be submitted, respecting which an ordinary share dividend of 5 per cent. only was paid.

OLYMPIC PORTLAND CEMENT.—In spite of the difficult conditions still affecting the industry, the profits of 1919 amounted to £24,420, against only £7,601 for the previous year. The dividend is raised from 5 per cent., less tax, to 7 per cent., less tax, while £5,247 is transferred to sinking fund (against £2,733 a year ago), and £5,222 provided for depreciation (against £1,193), leaving £9,241 to carry forward, against £7,541 brought in.

BRITISH COTTON & WOOL DYERS.—The trading profits of the British Cotton & Wool Dyers' Association for the past year, after providing for excess profits duty and charging £106,136 for repairs and renewals, were £189,331, and £38,160 was brought forward. It is proposed to add to the reserve £68,541, and to the depreciation fund £33,644. A dividend on the ordinary of 10 per cent. is recommended, carrying forward £39,003, subject to directors' fees.

JURGENS, LTD.—At the annual meeting in London on Tuesday Sir Charles Stewart, chairman of the company, who presided, said that during the past year the company had been converted from a private to a public one, the subscribed capital had been increased to £5,000,000 by two public issues, which had both been considerably over-subscribed, and the whole of the share capital of the Olympia Oil & Cake Co., Ltd., had been acquired. A dividend was declared of 7 per cent. on the ordinary shares according to the respective amounts paid up thereon.

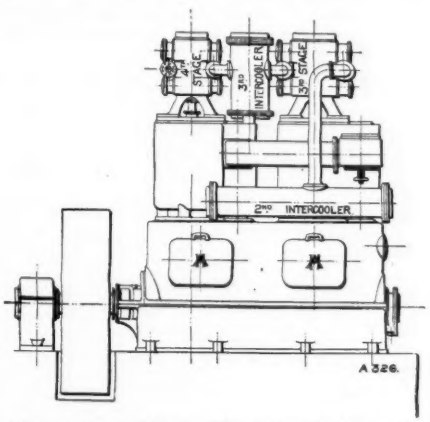
BRITISH OIL & CAKE MILLS.—There is to be no amalgamation of the British Oil & Cake Mills with the African & Eastern Trade Corporation. Expectations of a fusion are stated to have been responsible for much activity in Oil & Cake ordinary shares. The price has varied this year between 35s. 6d. and 57s. 3d., and last week, after fluctuating in erratic fashion, finished at 48s. 6d. As a consequence of the rumours in circulation, the board, it may be recalled, published a circular on April 8 announcing that negotiations had been opened with the African & Eastern Trade Corporation, but warning shareholders that the discussions were in quite a preliminary stage. The latest circular states that the negotiations were broken off on Friday, May 14, when it became evident that it would not be possible to submit an offer which the directors would be prepared to recommend the shareholders to accept. The directors go on to state that in their belief an appreciation in the market price of the company's shares was justified on intrinsic merits, and they advise shareholders to await the receipt of the report and accounts for the past year (now in course of audit) before coming to any conclusion as to the value of their shares. The annual meeting of the company is to take place before the end of June.

Catalogues Received

Alley & MacLellan, Ltd.

Not only do the bound catalogues contain illustrations and details of the numerous types of "Sentinel" air compressors, valves and accessories manufactured by the firm, but the business terms and telegraphic code for sizes, pressures and cost are given in full.

To meet the increasing demand for low pressure machines suited for liquor agitation, furnace blowing, &c., the firm have designed a machine of a somewhat similar outward appearance to their "Sentinel" two-stage compressor but the cylinder in this class of blower is of the simple, double-acting type, with distance piece intervening between cylinder and crankcase. The valve gear is also somewhat modified, a



SIDE-BY-SIDE FOUR STAGE AIR COMPRESSOR, FOR PRESSURES TO 1,200 LBS. PER SQ. IN.

simple piston valve actuating both inlet and discharge, but special trick ports are fitted where necessary. The lubrication throughout is on the forced system. Special gear is fitted to the larger double and triple-crank units to allow of considerable variation being obtained in the output where for instance lesser amounts of air at higher pressures are occasionally required. The machines are in numerous instances specially adapted to run as combined vacuum pumps and air compressors, and are recommended for compressing gas in large volumes, as is sometimes required in chemical works, &c.

Owing to increase in wages and cost of material the prices in the catalogue are cancelled, but terms will always be quoted against definite specification.—Sentinel Works, Polmadie, Glasgow.

J. Hopkinson & Co., Ltd.

The catalogue of 398 pages contains, in addition to illustrations and descriptions of the firms' numerous boiler mountings and valves, a detailed alphabetical index, code word and figure number indexes.

Among Messrs. Hopkinson's latest products is a novel arrangement of accessible back-pressure check feed valve, which is claimed to obviate many inconveniences and dangers now existing in the working of high pressure steam boilers, and enables the engineer to examine the check valve and, if necessary, repair it while the boiler is under steam.—Britannia Works, Huddersfield.

A. Gallenkamp & Co., Ltd.

LIST NO. 72 issued by this firm gives illustrations and full particulars of the graduated instruments for volumetric analysis they are manufacturing in a special department inaugurated for this work during the War. The department, which is turning out apparatus hitherto produced abroad, is equipped with very latest and best machines, and is working under time-saving, accurate and scientific methods.—19 and 21, Sun Street, Finsbury Square, E.C. 2.

BARRENECHEA NITRATE.—After providing for interest and bonus on the five-year notes, administration, and other charges, the net profits for the year 1919 is £20,057, and £19,086 was brought in, making £39,143. From this must be deducted £30,000 applied to redemption of the five-year notes. Out of the balance, it is proposed to pay a dividend of 15 per cent., less tax.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible or any errors that may occur.

London Gazette

Partnerships Dissolved

WHITE, W. F., and NICHOLS, E. H., electro-metallurgists and enamellers, under the style of The Northampton Plating Company, 71, St. Giles Street, Northampton, by mutual consent as from January 28. All debts received and paid by Ernest Henry Nichols, by whom the business will be carried on.

DENTON, JOHN, and DENTON, RICHARD, dyers, Keighley Dyeworks, Keighley, under the style of Denton Brothers, by mutual consent, as from January 31. All debts received and paid by John Denton, who will carry on the business alone, under the same style.

Notice of Intended Dividend

HANLEY, JAMES ALEC, lately residing at Vesper Mount, Kirkstall, Leeds, and now of 5, Woodsley Terrace, Leeds, agricultural chemist. May 29. H. C. Bowling, official receiver, 24, Bond Street, Leeds.

Liquidator's Notice

INTERNATIONAL LABORATORIES, LTD.—A general meeting of members will be held at 65, Coleman Street, E.C. 2, on June 23, at 10 a.m. A. Baker, Liquidator.

Companies Winding Up Voluntarily

FORTUNA NITRATE CO.—A meeting of creditors will be held at Dashwood House, New Broad Street, London, on Friday, May 28, at 12 noon. F. W. Bishop, Liquidator.

GLAMORGAN CHEMICAL CO., LTD.—Liquidator, Mr. E. E. Hill, 8, Working Street, Cardiff, Accountant.

HAIGH DYEING CO., LTD.—A meeting of creditors will be held at the offices of Pilling & Co., Chartered Accountants, 30, Brown Street, Manchester, on Friday, May 21, at 3 p.m. James Buck, Liquidator. The meeting is a formal one held to comply with the Companies Acts. All debts will be paid in full.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, created after July 1, 1908, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July 1, 1908, require registration. The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced since such date.*]

CUERDLEY CHEMICAL CO., LTD, WIDNES.—Registered May 3, mortgage securing all moneys due or to become due to National Provincial & Union Bank of England, Ltd; charged on Cuerdley Chemical Works and land at Widnes. *——. November 4, 1919.

JOHNSON & SONS, MANUFACTURING CHEMISTS, LTD., LONDON, E.C.—Registered May 7, £25,000 (not ex.) mortgage to Lloyds Bank, Ltd.; charged on land and factory buildings thereon at Hendon. *£89,500. July 9, 1919.

SOUTHERN COUNTIES TAR MACADAM, LTD., LONDON, S.W.—Registered May 4, £1,000 debentures (filed under sec. 93 (3) of the Companies (Consolidation) Act, 1908), present issue £100; general charge.

TRIPLEX GOGGLE MASK & LENS CO., LTD., LONDON, W.—Registered May 7, £2,000 and £2,000 debentures, part of £10,000; general charge. *Nil. January 2, 1920.

Satisfactions

CHROME CO., LTD., LONDON, E.C.—Satisfaction registered May 5, £12,040, part of amount registered March 14, 1911.

JOHNSON & SONS, MANUFACTURING CHEMISTS, LTD., LONDON, E.C.—Satisfactions registered May 7, £25,000 (not ex.), registered January 15, 1917; also £25,000 (not ex.), reg. September 13, 1918.

County Court Judgments

[*NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.*]

STREETLEY, C., 64, Waterway Street West, Nottingham, chemist. £10. 4s. 4d. April 9.

TOLCHARD, F. W., Bridge House, Long Melford, chemist. £37. 12s. April 7.

POMEROY, F. T., 5, The Exchange, London Road, Thornton Heath, chemist. £14. March 29.

New Companies Registered

The following list has been prepared for us by Jordan & Sons, Ltd., company registration agents, 116 and 117, Chancery Lane, London, W.C.:—

ARROWSMITH MANUFACTURING CO.—Manufacturers of all kinds of chemical appliances. Nominal Capital, £1,000 in 1,000 ordinary shares of £1 each. Directors to be appointed by subscribers. Qualification of directors, £1. Subscriber, A. H. Freeman, 5, Holborn, E.C. 1.

BRITISH GLUES & CHEMICALS, LTD., Imperial House, Kingsway, W.C. 1.—Glue, gelatine and fertiliser manufacturers and merchants. Nominal Capital, £2,000,000 in 700,000 8 per cent. cumulative preference shares and 1,300,000 ordinary shares of £1 each. Minimum subscription, 7 shares. Directors: W. S. Corder, 4, Rosella Place, North Shields (Chairman), ; W. Cotes, Knoll House, Market Harborough; H. J. Cotes, Sidmouth Lodge, Newcastle; R. Dunclafe, Crampton House, Sherwood, Nottingham; J. E. Grimditch, 8, Daleham Gardens, Hampstead; and 10 others. Qualification of directors, £1,000. Remuneration of directors, £450 each; chairman, £700.

BRITISH ZINC PRODUCTS, LTD., Pipe House, Wharf, Hafod, Swansea.—Nominal Capital, £25,000 in 25,000 shares of £1 each. Directors: F. Jones, "Rangemoor," Tavistock Road, Sketty, Swansea; H. W. Lloyd, 1, Eden Avenue, Sketty, Swansea; T. R. Jones, "Trefulla," 87, Cecil Street, Manselton, Swansea. Qualification of Directors, £300. Remuneration of Directors, £100 each.

C.E.B., LTD., 24, Ryder Street, St. James, S.W. 1.—Manufacturers of zinc oxide, tin oxide, refiners and treaters of ores and metals.—Nominal Capital, £20,000 in 20,000 shares of £1 each. Directors: Lieut.-Col. Sir R. C. Timple, Bart., Major-General Sir J. E. Capper, I. F. Townend, H. Maconochie, Major C. E. Banbury. Qualification of directors, 1 share.

CORNWALL CHINA CLAYS, LTD.—To deal in china clay, and china stone of all kinds. Nominal Capital, £100,000 in 100,000 shares of £1 each. Minimum subscription, £20,000. Directors: G. H. Johnstone, Trewithen, Grampound Road, Cornwall; N. F. Bellamy, 18, Grant's Walk, St. Austell; W. T. Lamb, Hembal, St. Austell; A. D. S. Stocker, Heathfield, Congleton, Cheshire; R. R. French, Belfield, St. Austell. Qualification of directors, £300. Remuneration of directors, £20 each.

NAPARIMA OILFIELDS OF TRINIDAD, LTD., Winchester House, Old Broad Street, E.C. 2.—To search for petroleum or other oils. Nominal Capital, £200,000 in 200,000 shares of £1 each. Minimum subscription, 7 shares. Directors: J. D. Fletcher, Rosehaugh, Avoch, Ross-shire; H. D. Arbuthnot, 22, Finch Lane, E.C.; J. Cross, 14, Austin Friars, E.C.; A. E. B. Ind, Winchester House, E.C.; J. Kelly, 6, Broad Street Place, E.C. Qualification of directors, £200.

NORTH PERSIAN OILS, LTD.—Dealers and producers of petroleum and other mineral oils. Nominal Capital, £3,000,000 in 3,000,000 shares of £1 each. Minimum subscription, 7 shares. Directors to be appointed by subscribers. Qualification of directors, £1,000. Subscribers, R. W. Grimaldi, 61, Fairbridge Road, Upper Holloway, N.; J. A. Fuller, 65, Hewitt Avenue, Wood Green; and five others.

ROSE PATENT FUEL CO., LTD.—Manufacturers of Briquettes and patent fuels. Nominal Capital, £500,000 in 500,000 shares of £1 each. Minimum Subscription, seven shares. Directors to be appointed by subscribers. Qualification of Directors, £1,000. Remuneration of Directors, £300 each; Chairman, £500. Subscribers: F. G. Excell, 32, Hide Road, Harrow; G. H. Daniell, 80, Coleman Street, E.C.; and five others.

H. S. WILLCOCKS & CO. (CHEMICALS), LTD., 5, Beaver Street, Manchester.—Indigo importers and general merchants of dyes and chemicals. Nominal Capital, £5,000 in 5,000 shares of £1 each. Directors: H. S. Willcocks, Red Lodge, North Road, Hale (Managing Director); F. H. Lowe, 27, Walmer Street, Gorton, Manchester; A. G. Willcocks, Red Lodge, North Road, Hale. Qualification of Directors, 100 shares.

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ON SALE.—Lancs. Boiler, 26 ft. by 8 ft., by Adamson, 100 lb. Vulcan, Bolton's superheater, Hamer's expansion joint, immediate delivery; three Lancs. Boilers, 30 ft. by 8 ft., 100 lb., M.S.U.A., delivery August.—BALDRIC ENGINEERING CO., 40, Blackfriars Street, Manchester.

TANKS FOR SALE.—One Rectangular Cast Iron Tank, 13,000 galls. capacity; one Rectangular Steel Tank, 8,200 galls. capacity; one Rectangular Steel Tank, 5,700 galls. capacity; three Boiler Tanks, 8 ft. diam. × 28 ft. long; large stock Smaller Tanks, all shapes and sizes, one Receiver, 4 ft. 6 in. diam. × 24 ft. 6 in., tested 160 lbs. Priced List on application.—FIRTH BLAKELEY, LTD., Church Fenton, Leeds.

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